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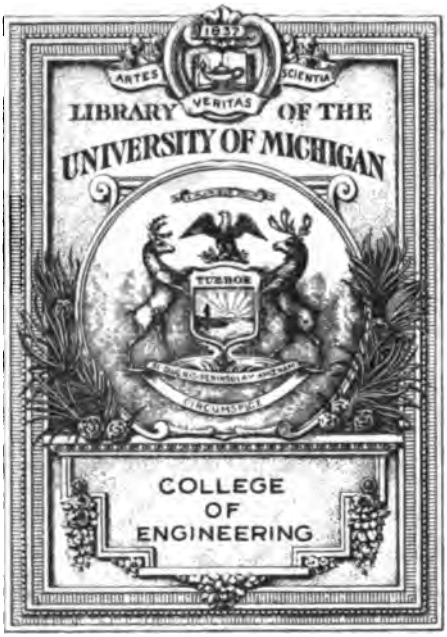

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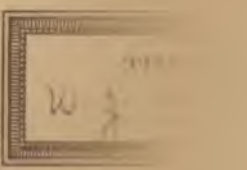

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CHEMICAL ABSTRACTS

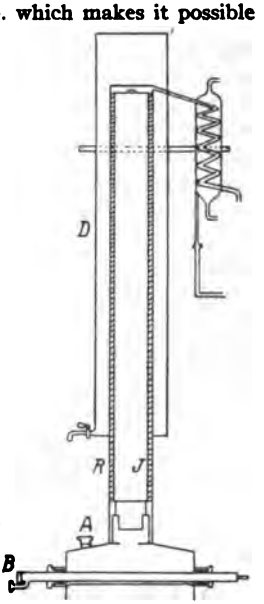
Vol. 9. NOVEMBER 10, 1915. No. 21.

I. APPARATUS.

L. C. JONES.

Buret, improved form. JOHN W. FORBING. *J. Am. Pharm. Assoc.* 4, 934(1915). —An illustrated description of a buret with a bulb similar to that of a thistle-tube at the top, designed to facilitate filling and emptying the buret. M. I. W.

Practical alcoholometry. H. P. BARENDRECHT. *Chem. Weekblad* 12, 736–41 (1915).—B. calls attention to the fact that in cases in which the alc. content of diluted alc. is high, the use of alcoholometers is without objection, but that this is not so in the case of fermented liquids. The principal error is caused by the presence in the distillate of small quantities of other volatile compds, which have but little influence on the sp. gr. but cause a great change in the capillary attraction. Detns. of alc. in different alc.-water mixts. with a pycnometer gave from 0.2 to 0.6% higher results than when an alcoholometer was used and the alc. content was 4.5 to 6.5%. The simple distn. method therefore is undesirable and B. recommends an app. which makes it possible to concentrate at least 99% of the alc. in $^1/_{20}$ of the original vol. He constructed a dephlegmator in such a way that the alc. condensed by the dephlegmator cannot run back into the liquid, but is temporarily retained in the rectifier and rectified. The boiling vessel, which is to be filled through the inlet, *A*, with $2^1/_2$ l. liquid has a capacity of $4^1/_2$ l. The vapors have to pass several copper diaphragms, where they are freed of drops carried over mechanically. The rectifier consists of a long tube, *R*, which is almost wholly filled with a tube, *J*. The latter is closed on all sides. The vapors are forced through a narrow ring-shaped opening (5 mm. diam.), which is left between *J* and *R*. Before the cylinder *J* is put in place, it is wrapped in 2 layers of copper gauze (meshes of 2 mm. diam.), which fill this ring-shaped space entirely. This construction causes the alc. to collect between the meshes of the copper gauze, so that it cannot pass to the condenser until the large vol. of water in the dephlegmator is heated by the condensed vapors to the b. p. of alc. rectified to a max., say 78°. When the temp. of the water in the dephlegmator has risen to near 100°, water starts to run from the condenser, which contains the remainder of the alc. The app. is made of copper. All connections should be soldered, to prevent leakage. B. advizes boiling with the aid of steam. The heating should be such that $2^1/_2$ l. of the liquid will not boil within 7 min.; the duration of a complete distn. is about 70 min. 125 cc. of the distillate are collected and contain about 50% alc., the exact strength of which may be detd. with an alcoholometer. Expts. show an error of +0.05% average and +0.08% max. for the new method and an error of —0.18 average and —0.36 max. for the old method (simple distn. to 50% of original vol.). Of 0.597 g. alc. in 3 l. H_2O, 0.588 g. was reclaimed in 30 cc. of the distillate.



J. T. FLOHIL.

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Apparatus for oriented crystal grinding. VICTOR M. GOLDSCHMIDT. Heidelberg. *Neues Jahrb. Min. Geol.* 39 (Beil. Bd., Bauer Festschrift), 186–92(1914).—A description with figure of an accessory app. for the grinding of crystals, to be used in connection with a 2-circle goniometer (*C. A.* 7, 721). The methods of using it and of locating the position of the desired face are discussed in detail. E. T. W.

Alternating current thermoregulators. F. A. MCDERMOTT. *J. Am. Chem. Soc.* 37, 2381–2(1915).—McD. calls attention to the fact that in his paper on a large incubator (*C. A.* 8, 3731) a system for a. c. thermoregulation similar to that of Davis (*C. A.* 9, 2470) was described. Experience has led to improvements which are discussed. E. J. C.

A direct reading potentiometer for measuring hydrogen ion concentrations. J. F. MCCLENDON. *Am. J. Physiol.* 38, 186–90(1915).—McC. describes the construction of a potentiometer which is calibrated at 23° and gives a direct reading of the H^+ conc. J. F. LYMAN.

A highly sensitive electrometer. A. L. PARSON. *Proc. Nat. Acad. Sci.* 1, 400–1 (1915).—The principle of working in a condition approaching instability is used to increase greatly the sensitiveness of the quadrant electrometer. F. W. SMITHER.

New form of nephelometer (MARSHALL) 11B.

GUEST, J. J.: **Grinding Machinery.** London: E. Arnold. 456 pp. 15 s, 8 d.

Brit., 12,124, May 16, 1914. J. F. P. KESTNER. **An evaporator of the climbing-film type** is combined with a sepg. chamber in such a manner that the upper ends of the tubes in the evaporator are above the highest level which the liquid may attain in the sepg. chamber. The sepg. chamber is of the kind comprizing a vapor sepg. chamber and a depositing chamber sepd. by a partition. Two evaporators may be used with 1 sepg. chamber, and a double valve may be provided in such fashion that both evaporators may be in action simultaneously, or either of the evaporators may be cut out.

Brit., 12,142, May 16, 1914. A. L. OBRADOR. **Continuous distilling apparatus** of the type comprizing a rectifying column and a series of boilers together with a worm returning condensates to the column.

Fr., 19,623, addition to 474,065, July 3, 1914. G. VERNON. **In a tank for storing benzine,** or like volatile combustible liquids, provision is made for the complete removal of H_2O. This is effected with the aid of a depression in the bottom of the tank, wherein the H_2O collects and from which it is withdrawn.

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2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS.

Assistants: E. B. MILLARD and A. B. CARTER.

A. I. Kisel. L. F. IL'IN. *J. Russ. Phys. Chem. Soc.* 47, 1037–48(1915).—Biographical. E. J. C.

Electronic conception of positive and negative valences. HARRY S. FRY. *J. Am. Chem. Soc.* 37, 2368–73(1915).—Polemical reply to Brunel (cf. *C. A.* 9, 1263). E. B. MILLARD.

Oxidation and reduction without the addition of acid. I. The reaction between ferrous sulfate and potassium dichromate. MARKS NEIDLE AND J. C. WITT. *J. Am. Chem. Soc.* 37, 2360–8(1915).—When $FeSO_4$ was titrated with dichromate in the

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absence of acid, a brown ppt. appeared after a few drops had been added, and a larger quantity of $K_2Cr_2O_7$ was required than when acid is present. The rate of the reaction in the absence of acid has been investigated, together with the conditions under which ferrous Fe may be pptd. in the presence of ferric and chromic salts. The method used was to add NH_4OH to the soln. and det. the unreduced dichromate in the filtrate by titration. Complete pptn. of ferrous and ferric Fe took place when the soln. was neutral and there were no NH_4 salts present to begin with, provided the concn. of Fe was sufficiently low and the soln. was boiled. A portion of $FeSO_4$ and some $K_2Cr_2O_7$ were kept together in a flask in a thermostat at 30°, and portions were withdrawn and run into excess NH_4OH from time to time. The reaction was 99.8% complete in one minute if the vol. of the soln. was at least 100 cc. The data were not sufficiently regular to justify a complete calcn. of the order of the reaction, but an attempt showed that the reaction was probably of a higher order than the 4th. The brown ppt. resembled $Fe(OH)_3$ and settled slowly. It was found to contain portions of all the salts produced in the reaction. The stoichiometric relations are the same as in the reaction with acid present. The rate of the reaction with acid cannot be proportional to the 2nd power of the acid concn., for then it should be zero without acid. Colloidal $Fe(OH)_3$ and $Cr(OH)_3$ are formed in the reaction without acid and coagulated by the SO_4 ion. E. B. Millard.

Solubility of silver nitrite and its degree of dissociation in a saturated solution. H. J. M. Creighton and W. W. Ward. *J. Am. Chem. Soc.* 37, 2333–8(1915).—Detns. have been made in the usual ways of the solubility of $AgNO_2$ in H_2O at 1, 15, 25, 35, 51 and 60°, and of the cond. of several solns. at 25°. From the latter it seemed probable that hydrolysis of the salt took place. The effect of added KNO_2 and added $AgNO_3$ on the soly. of $AgNO_2$ at 25° was also studied, and it was shown that the 2 salts have about an equal effect per mol. in lowering the soly. From the soly. of $AgNO_2$ in the presence of $AgNO_3$ the degree of dissociation of the former salt in a satd. soln. was calcd. to be 0.90, which is considerably greater than the value indicated by the cond. measurements. From this value, the soly. product const. for $AgNO_2$ has been calcd. as 5.86×10^{-4}. E. B. Millard.

Hydrogen potentials of sodium hydroxide solutions and the dissociation constant of water. F. C. Frary and A. H. Nietz. *J. Am. Chem. Soc.* 37, 2263–8(1915).—A normal HgCl electrode was connected through satd. KCl soln. to a H electrode immersed in NaOH at concns. of from 1.0 to 0.00078 *M* at 25°. Using these values and elec. cond. data from the literature, values of K_w were calcd. for each of the 6 concns. of NaOH used. Omitting the value in 0.00078 *M*, on account of difficulties met in the expts., the mean value was 1.76×10^{-14}. If the value for the most dil. soln. be included, the mean is 1.79×10^{-14}, at 25°. The values here obtained are used in the study of Na_2CO_3 solns. (cf. following abstract). E. B. Millard.

Hydrolysis of sodium carbonate in solution. F. C. Frary and A. H. Nietz. *J. Am. Chem. Soc.* 37, 2268–73(1915); see preceding abstr.—The value of the const. has been detd. in the expression $K = [NaOH][NaHCO_3]/[Na_2CO_3]$, where the concns. of the different substances include both the ionized and un-ionized parts. The potential of the H electrode has been detd. (by the method above) in 11 solns. of Na_2CO_3 in which the concn. varied from 2.0 *M* to 0.005 *M*, at 25°. The value of *K* should have approached $k = [HCO_3^-][OH^-]/[CO_3^{=}]$ as the diln. was increased, but *K* actually exceeded *k* at 0.005 *M*, where the carbonate is only 75% dissociated. If the value of K_w detd. in the preceding abstr. be used (1.76×10^{-14}) in place of the commonly accepted 1.12×10^{-14}, a much better agreement with the theory is obtained.

E. B. Millard.

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Experimental determination of the critical constants of nitrogen, of carbon monoxide, of oxygen and of methane. ETTORE CARDOSO. Univ. Geneva. *Atti accad. Lincei* **24**, I, 1056–7(1915); see *C. A.* **9**, 2474. E. J. WITZEMANN.

Displacement of metals by zinc in solutions of their salts. M. TZENTNERSHVER AND YUL. DRUKKER. *J. chim. phys.* **13**, 196–206(1915); see *C. A.* **9**, 2475. E. J. C.

The relation of the oxygen tension of the atmosphere to combustion. H. C. DALLWIG, A. C. KOLLS AND A. S. LOEVENHART. *Proc. Soc. Biol. Chem.; J. Biol. Chem.* **20**, 32(1915).—"In certain oxidations at least N_2 is a powerful inhibiting factor entirely apart from the proposition that it dilutes the O_2. Thus the flame of the candle is just extinguished at 116.4 mm. Hg oxygen pressure when this is lowered by the addition of N_2, whereas the flame is just extinguished at 19.8 mm. Hg oxygen pressure if the lowering is effected by evacuation. The results bring out a striking difference between combustion and vital oxidation inasmuch as the latter depends purely upon the O_2 tension, whereas in the former the N_2 tension plays an important role." I. GREENWALD.

Thermal analysis of mixtures of alkali hydroxides with the corresponding halides. I. Compounds of potassium. GUISEPPE SCARPA. Univ. Padoa. *Atti accad. Lincei* **24**, I, 738–46(1915).—It has long been known that some metallic oxides can combine with their respective halogen salts to form definite and stable compds. (called hydroxyhalides). Considerable work has been done on these compds. in the wet way but very little has been done at high temps. on the behavior of the oxides with the halides. Ruer (*Z. anorg. Chem.* **49**, 365(1906)) studied the system PbO–$PbCl_2$, Sandonnini (*Atti accad. Lincei* **23**, I, 959(1914)) studied PbO–$PbBr_2$ and PbO–PbF_2 and Truthe (*C. A.* **6**, 2372) studied Cu_2O–Cu_2Cl_2. The 1st 2 pairs form well-defined hydroxyhalides while the last 2 show no formation of compds. S. has extended these data and this paper is a report on the K compds. The systems KOH–KF, KOH–KCl, KOH–KBr, KOH–KI were investigated. The study of these systems is made difficult by the fact that it is hard to find a container that is not attacked by KOH and by the fact that KOH tends to absorb large amts. of moisture and CO_2 from the air. The mixts. were placed in a Ag crucible (since this material is little acted upon by fused KOH in the absence of O at moderate temps.); this is placed in an Fe cylinder, covered with a porcelain cover and the whole put in a resistance furnace in a current of H_2O and CO_2-free N. A Ag-Ni thermoelement made and calibrated in the lab. was used to measure the temps. since a Pt-Pt + Rd couple is attacked. The Ag-Ni couple was covered with a small Ag cylinder in making the solidification p. detns. and the slight changes in the Ag and Ni were found to be without appreciable effect on the e. m. f. For temps. above 900° (for KOH-KF mixts. containing much KF) a Pt crucible and Pt-Pt + Rd couple were used with success. The KOH used was 89.53% KOH, 1.47% K_2CO_3 and 9% H_2O; the latter was removed by heating it 45 min. at 500° in the furnace in an atm. of N. The m. p. of this KOH was 380° [Hevesy (*C. A.* **4**, 2763) found 360° and Neuman and Bergve (*C. A.* **8**, 3533) found 345°] and the point of transformation was 260° (Hevesy, 248°). The KF solidifies at 857° [Plato (*C. A.* **2**, 502) found 859.9° and Karandezen (*Centr. Min. Geol.* 1909) found 867°]. The solidification ps. of all the mixts. of KOH and KF stand between those of the 2 components which are completely miscible in the solid state and give mixed crystals of 1 kind only. Thus the point of transformation of KOH that results from the solidification p. curve gradually falls with the increase of the concn. of KF. The KCl used in the study of KOH–KCl m. 776°. In this system the primary crystn. curve falls from the solidification p. of KCl to that of KOH and shows an elbow at 430° at 67 mol. % KOH. The mixts. from 36 to 67 mol. % KOH show, besides the primary arrest, a secondary arrest

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of crystn. at 430°; the mixts. from 0 to 25 and 47 to 100 mol. % KOH show an interval of crystn. due to the formation of mixed crystals. This system belongs to the 4th type of Roozeboom since it gives 2 kinds of mixed crystals and a miscibility break. The point of transformation of KOH is markedly lowered by KCl and at 82 mol. % KOH is 120°. The point on the descending crystn. curve limiting the solid soln. of KCl in KOH could not be accurately detd. The KBr used in the system KOH–KBr solidifies at 760°. The solidification diagram of this system shows that the 2 components, if the formation of mixed crystals in the mixts. containing only small amts. of KOH is disregarded, are completely miscible in the liquid state. The eutectic arrest is at 300° with 75 mol. % KOH and disappears at 0 and 85 mol. % KOH. The point of transformation of KOH is rapidly lowered at first by the addition of KBr but becomes nearly constant at 205° with 90 mol. % KOH. The KI used in the system KOH–KI solidifies at 695°. The primary crystn. curve descends from the m. ps. of the 2 components and intersects at the eutectic at 250° at 73 mol. % KOH. The point of transformation of KOH lies a little above the eutectic arrest. The system KOH–KF gives solid solns. in all proportions; KOH with KCl and KBr gives solid solns. of 2 kinds with a miscibility break; KOH–KI gives a simple eutectic. II. Compounds of sodium. *Ibid* 955–61.—In continuing the expts. described above the systems, NaOH–NaF, NaOH–NaCl, NaOH–NaBr and NaOH–NaI were studied. The methods and technic were the same. The NaOH attacks Ag less than KOH and since it is stable at high temps. higher temps. could be used without any decompn. taking place. The NaOH used was 97.46% NaOH, 1.64% Na_2CO_3 and 0.9% H_2O. The m. and solidification points of NaOH are 310° and 290° (Hevesy found 318.4° and 299.5° and Neumann and Bergve found the solidification p. to be 300°); the m. p. of KF was 1005°. The system NaOH–NaF showed the formation of mixed crystals with a miscibility break, while KOH–KF gave 2 kinds of solid solns. The primary curve of crystn. lies between the solidification ps. of the 2 components and shows a slight break at 90 mol. % NaOH. For mixts. from 20 to 90 mol. % NaOH there is a 2nd arrest at 360°. The pt. of transformation of NaOH is somewhat lowered and forms, with the limit of the solid soln. of NaF in NaOH, a eutectic which shows a max. at 80 mol. % NaOH and which disappears at 5 and 100(?) mol. % NaOH. In mixts. of 5 to 80 mol. % NaOH it was possible to det. the duration of the eutectic arrest, but from 80 to 100 mol. % NaOH the arrest due to the transformation was also present. The system NaOH–NaCl shows a diagram similar to the preceding. The NaCl m. 806°. The primary crystn. curve shows a break at 350° and 75 mol. % NaOH; from 10 to 75 mol. % NaOH there is a 2nd arrest at 360°. The pt. of transformation of NaOH is rapidly lowered by small amts. of NaCl with the solid soln. of NaCl in NaOH as the limit and the formation of a eutectic arrest which is at a max. at 73 mol. % NaOH and disappears at 5 and 100% NaOH. The solidification p. of NaBr is 776°. The system NaOH–NaBr shows complete miscibility in the liquid state. The primary crystn. curve shows 2 branches which intersect at the eutectic, 260° and 80 mol. % NaOH. There is not even a slight tendency to form solid solns. The NaI m. 665°. The system NaOH–NaI gives a decomposable compd. From the solidification p. of NaI the primary crystn. curve descends regularly to 65 mol. % NaOH where there is a distinct break; then it descends further and intersects the descending solidification p. curve from the solidification p. of NaOH in a eutectic at 220° and 82 mol. % NaOH. In the mixts. up to 65 mol. % NaOH there is a 2nd arrest in the solidification p. curve at 300° which has a max. duration at 40 mol. % NaOH. This arrest coincides with the formation of a compd. decomposable on melting; 2NaOH.3NaI is probably its formula. The pt. of transformation of NaOH in a mixt. containing 3 mol. % NaI is practically the same as that of pure NaOH. Thus the systems NaOH–NaF and NaOH–NaCl give solid solns. of 2 kinds

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with a miscibility break; NaOH–NaBr gives a simple eutectic; NaOH–NaI gives a compd. decomposable at fusion (probably 2NaOH.3NaI). E. J. WITZEMANN.

The system of crystals. C. VIOLA. *Atti accad. Lincei* **24**, I, 680–90(1915).—A mathematical paper on the crystal system. E. J. WITZEMANN.

Isogonism. R. PANEBIANCO. Padua. *Riv. min. crist.* **40**, 1–33(1911); *Z. Kryst. Min.* **54**, 389–90(1914).—The relations between chem. compn. and cryst. form which have been based on isogonism, or correspondence in angles, are often quite accidental, as shown by tabulating, for instance, the angles of all known tetragonal substances. In triclinic substances isogonism is an indication of isomorphism, but its significance decreases with increase of symmetry. Errors in the statement of Hauy's law of rational indices which appear in many text-books are pointed out. E. T. WHERRY.

Methods of naming crystal forms. L. MILCH. Greifswald. *Neues Jahrb. Min. Geol.* **39** (Beil. Bd., Bauer Festschrift), 277–89(1914).—The names which have been applied by different writers to crystal forms of the 3 systems of lower symmetry are tabulated and discussed, and a standard, systematic (though cumbersome) method of deriving such names proposed for each class of these systems. E. T. WHERRY.

The structure of crystalline liquids. T. SVEDBERG. Upsala. *Kolloid-Z.* **16**, 103–6(1915).—The anisotropic property of a liquid-crystalline substance, as *p*-azoxyanisole, increases with increasing strength of a magnetic field in the same way that of iron oxyhydrosol does, and quite differently from that of a molecularly dispersed system. Likewise the increasing anisotropy with time, in weak magnetic fields, and with falling temp. starting from the "clear" point, and its decrease with addition of a foreign substance all point to the correctness of the Bose theory for liquid crystals (*C. A.* **1**, 2662; **2**, 1916; **3**, 139, 737, 1609; **5**, 1219). H. I. MATTILL.

Hydration and "solution" in gelatin. M. H. FISCHER. Cincinnati, O. *Kolloid-Z.* **17**, 1–7(1915); *Science* **42**, 223–6(1915).—Swelling and soln. are 2 different processes, swelling being only hydration while soln. also involves an increased degree of dispersion. F. shows exptly. that an 0.8 to 0.9% soln. of gelatin is solid (a gel) at 25°. A 2% soln. in 0.01 *N* HCl or 0.005 *N* NaOH does not solidify but remains a viscous liquid while if acid or NaOH is added to a solid 2% gelatin so as to bring the concn. of the whole mixt. up to 0.02 *N* the solid mass becomes liquid in 24 hrs. By adding increasing amounts of salts to a 0.015 *N* HCl or NaOH soln. of gelatin (which does not solidify on standing) the viscosity was increased and the mixt. solidified when the concn. of NaCl became 0.05 *N*. This was an optimum concn. and was the same for both HCl and NaOH; 0.1 *M* $CaCl_2$ and 0.12 *M* Na_2SO_4 had the same effect as 0.05 *M* NaCl in 0.015 *N* HCl and were likewise optimum concns. Greater concns. of acid in the presence of NaCl prevent gelatinization. Calcium chloride, bromide, nitrate, iodide, thiocyanate, sulfate, citrate and tartrate all prevent the soln. of gelatin by acids, the tartrate and citrate being most effective. This is explained on the assumption that gelatin is capable of different degrees of polymerization; at high temp., in presence of acids and alkalies, there is a slightly associated mol., with opposite conditions a more associated mol. The mols. are capable of adsorbing most water when of medium size; neutral gelatin with large particles adsorbs only a little water. Acids raise the hydration by bringing the particles to the optimum size, while more acid further decreases the size of the particles and finally causes soln. This explains the use of hypertonic salt solns. in cases of edema, albuminuria, etc., the antagonistic action of acids or bases and salts, and it also accounts for the fact that a wound first swells, then softens. Previous theories explaining these effects as due to increased permeability of the cell membrane have not the exptl. evidence that this simpler, colloid-chemical theory has. H. I. MATTILL.

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The relation between the Tyndall effect and the size of the particles of colloidal solutions. W. MECKLENBURG. Berlin. *Kolloid-Z.* 16, 97–103(1915).—The validity of Rayleigh's law, that the intensity of light from a Tyndall ray $\times \lambda^4$ is directly proportional to the concn. of the sol and the volume or size of the particle, and inversely proportional to its sp. gr., was tested on ten different S sols prepd. by the method of Sven Oden (*C. A.* 6, 1700). The size of the particles of S sol had been detd. by the Siedentopf method, or in cases where the particles were too small to be seen in the ultramicroscope, by comparisons of rates of diffusion and osmotic pressures. Rayleigh's law holds only for particles up to about 100 $\mu\mu$ diameter; for particles greater than 100 $\mu\mu$ the Clausius law, substituting λ^2 for λ^4 in Rayleigh's law, better expresses the facts. The proportionality between the intensity of the Tyndall ray and the concn. of the sol (other variables being fixed) was without limit. H. I. MATTILL.

Rhythmic formations on solidification of sulfur. A. v. FISCHER-TREUENFELD. Kiel. *Kolloid-Z.* 16, 109–11(1915).—When very thin layers of molten S solidify they frequently take on an appearance similar to the agate structures described by Liesegang in the case of ppt. formation in gels. The S on solidifying contracts and then draws up the liquid S about it by capillarity, thus forming a ridge of S deeper than the av. depth while adjacent to the ridge is a depression where solidification has overtaken the S before that lost to the ridge could be regained from the surrounding melt.
H. I. MATTILL.

The adsorptive power of peat ("Torfmoors"). P. ROHLAND. Stuttgart. *Kolloid-Z.* 16, 146–8(1915).—Peat adsorbs, but with less energy than clay (cf. *C. A.* 9, 1567). It contains colloidal materials which have the ability to adsorb dyes of complex structure, but not of simple structure. In contrast with clays it readily adsorbs dyes rich in N as Safranin and Vesuvin. It also adsorbs methylene blue, methyl violet, malachite green, brilliant green, nigrosin, fluorescein, eosin, indigo, logwood dye, brazilwood dye, carmin, starch and colloidal ferric hydroxide. H. I. MATTILL.

Heats of dilution of concentrated solution. W. S. TUCKER. *Trans. Roy. Soc. London* (*A*) 215, 319–51(1915).—The calorimeter consisted of a 400 cc. Dewar tube closed by a cork stopper through which passed the elec. connections to the resistance thermometer, a high-speed rotary stirrer, a thin-walled glass pipet with its delivering end bent upward above the bulb, then down again like a siphon, and an elec. heater. The water for diln. (generally 25 or 45 cc.) was contained in the pipet and was immersed in the soln. for some hours before the diln. took place, during which time the stirrer was operated continuously. The thermal capacity of the calorimeter and its contents were detd. under the varying conditions from the heating effect of a known current passing through the heater when it was immersed in a given wt. of H_2O in the calorimeter. The heat produced by the stirrer so nearly compensated that lost by radiation that no change of temp. greater than 0.01° took place over long periods. Sp. heat values were found by using the heater as above, and measuring the current and resistance with an ammeter and a voltmeter. All of the observations were taken with the initial temp. that of the air. HCl has been diluted from 22.80 to 4.06 mols. per 100 mols. H_2O in 10 stages, and the sp. heat and heat of diln. measured for each concn. Similar expts. were made with 16 concns. of LiCl, 11 of NaOH and 13 of $CaCl_2$. The heat of diln. per mol. of added solvent decreased rapidly but regularly with the diln. for HCl and NaOH. The change of heat of diln. with the temp. was detd. for HCl and LiCl, and found to increase with the temp. in both cases. A detailed discussion of all previous work and a bibliography are given. The change of heat of diln. with the temp. could be expressed by equations of which the following for HCl is typical: $dQ/dN = (4082/N) - 272.1$. As the solns. become more dil., they become more complex. Thermal changes occur in strong aq. solns. which suggest

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that the solute is dissolved, not in H_2O, but in some definite hydrate of the solute, in general contg. a large no. of mols. of H_2O. In special cases (HOAc) the H_2O mols. may be few in number, while with HNO_3 and HBr the solvent becomes pure H_2O. $CaCl_2$ does not show the effect in so marked a degree, probably because it was impossible to work with solns. of the same relative strength. E. B. MILLARD.

Free energy of nitrogen compounds. G. N. LEWIS AND E. Q. ADAMS. *J. Am. Chem. Soc.* 37, 2308–16(1915); cf. *C. A.* 8, 3741, 3743; 9, 986.—Further calcns. of $\Delta F°_{298}$ as follows: NH_3 (*g*) —4740, NH_3 (*l*) —3490, NH_3 (*aq*) —7130, NH_4OH (*aq*) —63750, NH_4^+ —19895, NO (*g*) 20850, NO_2 (*g*) 13250, N_2O_4 (*g*) 25300, NO_3^- —23100, NO_2^- —7410, and HNO_2 —11980 cals. E. B. MILLARD.

The free energy of formation of formic acid. G. E. K. BRANCH. *J. Am. Chem. Soc.* 37, 2316–26(1915).—Solns. of HCO_2H were heated to 156° and 218°, resp., in a quartz tube fused to a calibrated manometer. The reaction tube was suspended in a vapor bath of C_6H_5Br or $C_{10}H_8$. In the first expt. a dil. soln. of HCOOH was heated to 156° for 14 days without any indication that equil. had been reached, and a catalyst (HCl) was then added. The mechanism of the catalysis was not investigated, but it was found that any mineral acid had the same effect. Tables are given showing the pressure in the app. at various stages in the expts. The concn. of HCOOH was detd. by titration with standard KOH or (in 1 expt.) with $KMnO_4$. The formation of HCOOH from CO and H_2O was shown to be reversible, and to be catalyzed by acids. From the data obtained, together with that of Lewis and Randall, the free energy of formation of HCOOH from graphite, H_2 and O_2 was $\Delta F_{298} = -85200$ cals. E. B. M.

Contractive and expansive energies of volume and surface and the physico-chemical properties of substances. P. P. VON WEIMARN. *J. Russ. Phys. Chem. Soc.* 46, 1905–52(1914).—An exposition of V.'s views on matter. The work is to appear in book form where exptl. and mathematical proof will be given for the statements made in this article. The most essential of these are as follows: Ostwald's definition of dispersion (*D*) as the ratio of surface (*S*) to vol. (*V*), $D = S/V$, does not sufficiently det. the properties of a system, since, *e. g.*, 2 particles may have the same *S* and *V* and still be different in many respects on account of a difference in structure, the matter in one being continuous, in the other granular. In certain chem. reactions the granular particle could break up into smaller ones, while the continuous could not. Every system has 2 forms of energy, expansive and contractive. When the degree of dispersion increases, the tendency of the system to contractive processes also increases, provided the capacity factor of the energy of the system be capable of diminishing, and the intensity factor remain const. In a unit of space it is impossible to conc. the contractive energy of surface above a certain limit. When this limit is reached an expansive process sets in, accompanied by a conversion of contractive energy into other forms. This limitation of concn. of a given kind of energy in a given space holds good for all forms of energy. Hence Le Chatelier's rule that the m. p. of a substance which expands upon fusion continuously rizes with the pressure is true only up to a certain limit of the latter, above which an expansive process begins which, neutralizing the pressure, prevents a further rise of the m. p. The varying ability of small particles to run together into larger units, as when small droplets of a liquid unite to form large drops, is designated as the degree of porousness. It is the reciprocal of compressibility. Liquids being the least compressible of substances have the highest degree of porousness. Considering a chem. element at its m. p., it is evident that the higher this is the greater the contractive force which drives the particles towards each other. On the other hand, the greater the wt. of these particles the slower their tendency to separate, and therefore the less the contractive force required to hold them together. Hence the degree of porousness (*B*) of an atom is

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directly proportional to its m. p. (T_s) on the abs. scale and inversely to its at. wt. (A), *i. e.*, $B = T_s/A$. The values of B for Ca, Sr, Ba and Ra are, resp., 26.26, 12.25, 8.17 and 4.29. It is proved that the changes in the va'ues of B follow the periodic system of the elements. Seeing that B for Nt is 0.91, and for Ra 4.29, there ought to be an element whose A is 224 and T_s 290°, so that its B = 1.3. It ought to be very unstable. With the hope that it will be discovered by a Russ. chemist, it is named rossium (Ro). The disaggregation of an element takes place when its contractive energy ceases to be in equil. with its expansive energy and begins to exceed it. The metallic and the metalloid states are characteristic of all elements, the latter being in the metallic state when the temp. is low and the pressure high, while under reversed conditions they are in the metalloid state. Hence metalloids are convertible into metals by lowering their temp. and compressing the ats. themselves (not the interatomic distances). The usual definition of abs. temp. is criticized for ignoring the contractive energy of vol. Instead of defining it as the temp. at which the vol. is zero, it should be defined as the temp. at which the contractive energy is 0. Thus defined, the abs. temp. varies from substance to substance. By rather complex calcns. which cannot be briefly abstrd. it is shown that several magnitudes, *e. g.*, the amplitude of vibrations of atoms in crysts., the av. distance between atoms, the coeffs. of compressibility, are functions of B, and that Einstein's formula for the relation between total energy and temp. may be deduced from the conception of B, without resorting to the quantum theory (*Ann. Physik* [4] 22, 185). It is also shown that the relation between the periods of rotation of atoms belonging to the same periodic group and their distances from each other in the mol. is expressed by an equation of the same form as Kepler's equation for the relation between the rotation periods of planets and their distances from the sun. H. M. GORDIN.

The Nernst equation. JOHN D. EGGERT. *Naturwissenschaften* 3, 452(1915).—A review. C. G. F.

Viscosity of sugar solutions. H. GREEN. *Proc. Chem. Soc.* 30, 158–9.—An answer to Powell (*C. A.* 8, 1900). R. L. SIBLEY.

Phenomenon of passivity in connection with ferrous alloys of different composition and structure. H. W. MOSLEY. *J. Am. Chem. Soc.* 37, 2326–33(1915).—A large number of samples contg. C, Si, Mn, S, and P as variables, a set of Carnegie commercial steels contg. 0.11% to 1.12% C and fairly const. proportions of other impurities, and a set which had been subjected to various heat treatments with corresponding changes in structure, served as exptl. material. The samples were made anodes in electrolytes of the same compn., and in different electrolytes at various concns. Tables are given showing the % compn. of each sample, and current densities necessary for transition from active to passive. The electrolytes were 10 and 5% HNO_3, N and 0.5 N H_3PO_4, N Na_2SO_4, 10% H_2SO_4. Samples of very different compn. and structure can be made passive when used as anodes. The transition current density from active to passive is not related in any simple way to the structure or compn. of the sample, but the nature and concn. of the electrolyte are factors in bringing about passivity in these samples just as for pure Fe. The phenomenon is not an instantaneous change from active to passive, but a gradual adjustment toward a new set of equil. conditions. The c. d. necessary for passivifying increases with the electrode potential. Metals with a low soln. tension generally passivify at a lower c. d. than those with a high soln. tension. E. B. MILLARD.

Mobilization of metals. M. TZENTNERSHVER. *J. Russ. Phys. Chem. Soc.* 47, 537–9(1915).—Polemical. Thiel (*C. A.* 8, 3390) failed to present new facts in support of his views, and his preference for the term "mobilization" of metals of passivity is considered unworthy of serious discussion. H. M. GORDIN.

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Electrical conductivity of mixtures of fused salts. C. SANDONNINI. Univ. Padua. *Atti accad Lincei* 24, I, 616–21(1915).—The elec. cond. of many fused salts has been accurately detd., especially by Kohlrausch, Lorenz, Arndt (*Z. Elektrochem.* 12, 337 (1906); *C. A.* 2, 3338; *C. A.* 1, 2772), Tubant (*C. A.* 8, 2519), Goodwin (*C. A.* 2, 936), and Aten (*C. A.* 4, 271, 2901; *C. A.* 6, 176). Very little has been done on the cond. of fused mixts. Poincare (*Ann. chim. phys.* [6] 21, 289(1890)) found that the value of the cond. of mixts. of fused salts may be calcd. according to the rule of mixts., but Lorenz and Kalmus found that the conds. of fused KCl and $PbCl_2$ are much less than the calcd. values; these deviations are attributed to the formation of complexes. Goodwin and Mailey (*C. A.* 2, 936) studied $NaNO_3$-KNO_3 which m. at relatively low temps. and in which the cond. is always less than the calcd. value. A large amt. of data on the thermal analysis of many pairs of salts has been obtained in the last yrs. and guided by these results S. has undertaken a systematic study of the elec. cond. in various cases. The Kohlrausch method of detg. the cond. was used. Fused salts are generally good conductors and thus it was necessary to select a cell which has high resistance and can bear high temps. The cell used is described. The cond. cell was of quartz. The mixts. were kept in a fused state in a large elec. resistance furnace in an atm. of N_2. The temp. was detd. with a Pt-Pt + Rh couple. The cond. of the salts used at 500° in reciprocal ohms were detd. as follows: $PbCl_2$ 1.472, $PbBr_2$ 1.030, AgCl 3.654, AgBr 2.920, TlCl 1.224. The m. ps. are as follows: $PbCl_2$ 495°, $PbBr_2$ 368°, AgCl 455°, AgBr 422°, TlCl 429°. Cond. detns. for the system $PbCl_2$–$PbBr_2$ at 500° on 7 mixts. showed a max. drop of 4.00% from the calcd. value at the ratio 1:1. Five detns. on the system AgCl–AgBr showed a max. drop of 1.27% at 5 mol. % AgCl. In neither of the preceding systems were complexes observed by the thermal analysis method. With the system TlCl–AgCl (*C. A.* 6, 704) thermal analysis gave a compd. decomposable on fusion. The elec. cond. data show a max. drop of 27.21% over the calcd. value at 50 mol. % TlCl. But no definite conclusions can be drawn from the sp. cond. because of possible variations in the d. of the mixts. of 2 salts. E. J. W.

Liquid junction potentials. D. A. MACINNES. *J. Am. Chem. Soc.* 37, 2301–7 (1915); cf. *C. A.* 9, 1709.—For cells of the type Ag | AgCl(solid) | KCl(C_1) | KCl(C_2) | AgCl(solid) | Ag, the liquid junction may be calcd. from the e. m. f. of the cells with transference and without transference, and the value of n_c, the transference number of the cation. The expression derived was $E_L = (E/2n_c)(2n_c - 1) = E(1 - 1/2n_c)$ where E is the e. m. f. of the cell without transference, E_t the e. m. f. of the same cell with transference, and E_L the junction potential. Junctions of cells of this type with NaCl, KCl, and HCl have been calcd. from Jahn's data and Noyes and Falk's (compiled) transference numbers, and the deviation from the mean of the values for E_L av. about 0.1 millivolt. By combining junctions to which the above equations apply with junctions the voltage of which may be computed by Lewis and Sargent's formula, the potential between any 2 uni-univalent salt solns. may be calcd. to a few tenths of a millivolt. E. B. MILLARD.

The electromotive force of calcium amalgams. II. LIVIO CAMBI. Milan. *Atti accad. Lincei* 24, I, 817–22(1915).—In a preceding paper the e. m. fs. of Ca amalgams (*C. A.* 9, 2182) toward MeOH solns. of $CaCl_2$ at —80° were detd. Some additional data on the e. m. fs. in MeOH solns. are given. Commercial pyridine was kept over fused KOH some days and then rectified. The C_5H_5N soln. of CaI_2 was 0.0093 *M* and satd. at 15°. The electrodes were constructed like those used in MeOH solns. by Isgarischew. The C_5H_5N solns. were kept in an atm. of pure, dry H. For concns. of Ca of 1 to 25 atom % the cell Ca_xHg_{100-x} | CaI_2 0.0093 *M* | $AgNO_3$ 0.1 *M* | Ag at 25° showed e. m. fs. as follows: 1%, —1.846 v.; 2.5, —1.842; 7.5, —1.824; 10, —1.836; 12.5, —1.828; 15, —1.840; 17.5, —1.758; 20, —1.816; 22.5, —2.040; 25,

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—1.995. Amalgamated Ca in the cell Ca | CaI_2 0.0093 *M* | $AgNO_3$ 0.1 *M* | Ag at 25° showed —2.160 v. and after 4 hrs. —1.980 v.; another test gave —2.130 v. and —1.640 v. after 5 hrs.; nonamalgamated Ca gave —2.130 v. and —1.640 v. after 5 hrs. The Ca amalgam becomes covered with a black deposit insol. in C_5H_5N. The e. m. f. rapidly decreases for Ca; has also been observed with other metals and amalgams in this solvent. With Na the addition compd. $Na(C_5H_5N)_2$ was observed by Emmert (*C. A.* 9, 85). From the plotted values the existence of the compd. $CaHg_4$ is indicated. The solid phase 1 Ca:7–9 Hg formed in MeOH at —80° is not indicated at this higher temp. Since thermal analysis did not reveal any other compd. than $CaHg_4$, but indicated the existence of partial miscibility phenomena in the solid state between this compd. and Hg, it seems probable that the deviations of the e. m. f. in MeOH are due to the presence of solid solns. Similar phenomena were observed with Na-Hg by Haber and Sack (*Z. Elektrochem.* 8, 245(1902)) and Sack (*Z. anorg. Chem.* 34, 37(1903)). The difference in the e. m. f. between Ca and $CaHg_4$ is 0.388 v.

E. J. WITZEMANN.

The variation of resistance of bismuth in the magnetic field. G. C. TRABACCHI. Univ. Rome. *Atti accad. Lincei* 24, I, 1053–5(1915).—The variations in resistance that some metals undergo in the magnetic field become quite significant for Bi. The cause of this variation is obscure. It cannot be explained by the electron theory. The values found by various workers for this variation of the resistance are discordant. Since all specimens used were carefully purified it must depend on the manner of cooling and the structure of the metal. Pure Bi was powdered and pressed into a sheet with a proper machine. The sheet had the external appearance of fused Bi and its mechanical properties were nearly the same; the sp. resistance was a little higher; internally it differed in that it lacked large crystals. The resistance was measured by a method described by Corbino and T. (following abstr.). Using disks 1.8 mm. thick and 20 mm. wide γ/γ° for fused Bi is 1.20 and for compressed Bi powder 1.04, where γ is the sp. resistance of the sheet in the field of 5400 c. g. s. units and γ° the sp. resistance out of it. The variation in the resistance in the sheet of compressed powder is reduced to a very small amt. Sheets of the powder prepared by reducing a Bi salt by chem. means showed practically no variation in fields of even 10000 c. g. s. units. It is concluded that a sheet of fused Bi shows both the Hall effect and the variation in the resistance in the field, but powdered and reassembled by compression the variable resistance in the field disappears.

E. J. WITZEMANN.

The electric resistance of a sheet in a magnetic field. O. M. CORBINO AND G. C. TRABACCHI. *Atti accad. Lincei* 24, I, 806–9(1915).—A description of a new method of making this measurement.

E. J. WITZEMANN.

The Stark-LoSurdo phenomenon in helium. RITA BRUNETTI. Florence. *Atti accad. Lincei* 24, I, 719–23(1915).—The expts. of LoSurdo (*C. A.* 8, 1910, 2978) on the Balmer series developed the 1st example of qual. differentiation among the various lines of a series and showed that the conception of decompn. cannot be applied unchanged to new spectral facts. It seems opportune to begin to collect the material that will serve for the development of a model for the construction of a theory of the phenomenon. In the expts. with He described in this paper certain results were obtained that could not be obtained by the Stark method. From these expts. it is concluded that under the action of the elec. field: (1) various lines of He are decomposed and the decompn. is unsymmetrical with respect to the fundamental line; (2) any line shows a satellite on the side of the short λ, *i. e.*, a decompn. element formerly at the beginning of the elec. field detached from the principal line, and the removal increases as one approaches the cathode; (3) the same law does not apply to both the weakening

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of the decompn. and to the weakening of the satellite; (4) the lines of the 3rd accessory diffuse series do not decompose into the same number of components. E. J. W.

Action of penetrating radium rays on colloids (FERNAU) 11A. Diffusion in surface layer of solutions of colloids and crystalloids (BERCELLER) 11A. Reaction potentials of silver (REEDY) 4. Rational color atlas (OSTWALD) 25.

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3. RADIOACTIVITY.

WILLIAM H. ROSS.

The radium-uranium ratio in carnotites. S. C. LIND AND C. F. WHITTEMORE. Bureau of Mines, *Tech. Paper* 88, 1–28(1915); see *C. A.* 8, 3756; 9, 1714. W. H. R.

Radioactivity of spring water. R. R. RAMSEY. Indiana Univ. *Am. J. Sci.* 40, 309–13(1915).—Measurements of the Ra Em contained in the waters of 46 springs and wells in the states of Ohio and Indiana gave results which varied from 27×10^{-12} to 2150×10^{-12} curies per l. W. H. ROSS.

The ionizing potential of an X-ray tube. E. C. DREW. Univ. Penn. *J. Franklin Inst.* 179, 697–709(1915).—A preliminary account is given of an investigation undertaken to test the truth of the assertion that it takes a much higher voltage to break

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down the gap between the electrodes of a Röntgen tube and start the ionizing current flowing than it does to maintain this flow once started. The results go to show that the X-ray tube is a const. potential device which tends to maintain a const. drop across it. There appears to be an ionization potential distinct from the running potential, but it is nothing of the order that is generally supposed. The tubes used were of the standard commercial types, but the H tube was used to the greatest extent because of its great flexibility in enabling the vacuum to be controlled up or down. The energy which goes into ionization in the H tube is apparently a greater percentage of the total energy supplied than in the M. and W. tube. This may account for the fact that more heat appears during operation in the latter case than in the former. W. H. Ross.

The relation between uranium and radium. VI. The life-period of ionium. F. Soddy and Ada F. R. Hitchins. Univ. Aberdeen. *Phil. Mag.* 30, 209–19(1915).—A continuation of the Em measurements of the amt. of Ra produced in a purified U soln. shows no notable increase in the rate of growth of Ra in the case of 2 early solns. from which the U X and Io had been removed by extraction with ether. A third such sample shows an increase, while a fourth sample of 3 kg. of U, prepared by recrystn. in 1909, shows a three-fold increase in the rate during 1912–15 as over that in the first 3 yrs. The rate of production of Ra is thus proportional to the square of the time, as is required by theory if Io is the only long-lived member of the series between U and Ra. If the av. period of Ra is 2375 yrs., that of Io is calc. to be 97,000 yrs., or, on the basis of the third soln., 104,000 yrs. The 3 early solns. are considered less reliable because they contain less U, and the Io was not completely removed.

G. L. Wendt.

Action of radium rays on mixtures of arsine and oxygen. H. Reckleben and G. Lockemann. Leipzig and Berlin. *Z. anorg. allgem. Chem.* 92, 145–68(1915).—Mixtures of AsH_3 and H, and AsH_3, H and O were exposed for about 100 days to the action of β- and γ-rays from 5 mg. of $RaBr_2$, and the rate of change in vol. noted and compared with check expts. AsH_3 decomposes at ordinary temp. with formation of H_2O, As, H and H_2As_2(?). Exposure to the β- and γ-radiations accelerates the action, but also causes oxidation of the As, with formation of H_3AsO_3. George W. Morey.

The excitation of gamma rays by beta rays. Miss Jadwiga Szmidt. Univ. Manchester. *Phil. Mag.* 30, 220–4(1915).—A detn. of the absorption coeffs. in Al of the "emergent" secondary γ-rays excited in sheets of Fe, Ni, Cu, Zn, Ag and Sn by a beam of β-rays from a Ra D and Ra E plaque. Measurements were made by a simple Al electroscope containing CH_3I vapor, the effect of primary γ-rays being subtracted. In every case the values for μ/ρ agreed within exptl. error with those found by Barkla and Sadler (*Phil. Mag.* 17, 739(1909)) for the characteristic secondary X-radiation given off by the same metals under bombardment by X-rays. The values in $cm.^{-1}$ Al are, resp., 91.3, 58.8, 46.8, 39.8, 2.6 and 1.6. The 2 classes of rays are therefore identical. No "L" series was found. Cf. *C. A.* 8, 3152. G. L. Wendt.

The passage of alpha particles through hydrogen. II. E. Marsden and W. C. Lantsberry. Wellington, N. Z. *Phil. Mag.* 30, 240–3(1915).—An attempt to measure the number of H particles ejected at high velocities when a beam of α-rays falls on a layer of H resulted in the discovery that the α-ray tube containing Ra Em itself emitted occasional long-range particles capable of producing scintillations several cm. beyond the range of the α-rays. Absorption measurements showed they were H particles, but their velocity is not uniform. The presence of a film of wax ($C_{27}H_{56}$) about 10μ in thickness on the α-ray bulb only doubled the number of H particles. From this the layer of H necessary to give out the observed particles needs to be 1.6 cm. in thickness, and no such amt. was present. In order to remove occluded H and H_2O a sheet of Ni with a deposit of Ra C, heated to 150°, was tested, and was found

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to show a three-fold increase in the long-range radiation. H particles, therefore, seem to be emitted from radioactive atoms, but not with a uniform velocity.

G. L. WENDT.

X-rays and crystal structure. W. H. BRAGG. *Trans. Roy. Soc. London* 215, 253–74(1915); see *C. A.* 9, 167, 1579, 1581. E. B. MILLARD.

Do chemical rays penetrate the upper eyelid? (SOLGER) IIA. Action of penetrating radium rays on inorganic and bio-colloids (FERNAU) IIA.

JONES, H. C.: **The Electrical Nature of Matter and Radioactivity.** 3rd ed. New York: D. Van Nostrand Co. 212 pp. $2.00.

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4. ELECTROCHEMISTRY.

COLIN G. FINK.

The electrochemical possibilities of the Pacific coast. J. W. BECKMAN. *Trans. Am. Electrochem. Soc.* 28 (advance copy); illus.—Enormous quantities of cheap power are available. The manuf. of caustic soda is especially well adapted to the Pacific Coast: low salt cost and large market for the NaOH as well as for the bleach.

G. G. F.

Electrolytic antimony refining. A. G. BETTS. *Trans. Am. Electrochem. Soc.* 28 (advance copy).—Owing to its slightly higher deposition voltage it was expected that As would dissolve from the anode and accumulate in the soln., until, by virtue of its increasing concn., it finally deposited in the cathode metal as fast as it dissolved from the anode. This, however, was not realized. It was found that there was no difficulty in eliminating Pb, Bi and Cu even with very low Sb in the anode. The soln. does not become contaminated with impurities, but the c. d. is low, the voltage high and only about $^1/_2$ the As could be kept in the anode slime. By using an anode containing 87% Sb and only 6% As instead of 12% As in the first expt., it was found that there was no need of scraping off the anodes. There was, however, a larger proportion of the As (60%) in the cathode metal. The deposit was physically good. It was found that the effect of Cu in the anode in holding back the As in the slime was very slight. The presence of H_2SO_4 was found to interfere to a large extent with the tendency toward sepn. of As and Sb. It is shown that by using the fluoride soln. with an anode containing about 3.5% As about $^1/_2$ of the As is eliminated so that by several refinings it might gradually all be removed. The most positive effect noted is that due to comp. of soln.; an increase in HF is highly beneficial and the presence of sulfates or H_2SO_4 objectionable. Attempts to purify Sb by crystn. of As-Sb alloys of 3–8% As content gave, in all cases, crystals and liquid portions containing the same % of As.

W. E. RUDER.

Anodic potentials of silver. I. The determination of the reaction potentials of silver and their significance. J. H. REEDY. *Am. J. Sci.* 40, 281–98(1915).—The p. d. that must exist between a metal and a soln. in order that a definite action may begin is best detd. by the third-cathode method. This reaction potential is taken as the point of greatest curvature on the current-potential graph in the case of polarizable Ag electrodes where the products of the reaction are sol. With Ag anodes, this value was found to be the same (0.521 v.) for a large number of electrolytes regardless of concn. When the Ag compd. formed is insol. or contains the Ag largely in the form of complex ions, reaction potentials lower than 0.521 are obtained. Except in the neighborhood of the soln. potential of Ag these "deposition potentials" were found to

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be logarithmic functions of the dilutions, in accordance with the Nernst formula for e. m. f. The increase of reaction potential with dilu. was, however, found to be somewhat greater than calcd. Two deposition potentials were noted in certain electrolytes, the lower one due to the deposition of the anion. In general, the presence of cations of other metals had no effect upon the reaction potential of Ag. Cu and Hg, however, caused an increase in the potential, due, it is thought, to the formation of solid solns. with the Ag, with a resultant lowering of its electrolytic soln. pressure. A description of the app. is given. W. E. RUDER.

The plating of the troublesome die-castings. S. HERRICK. *Metal Ind.* 13, 373–4 (1915).—H. uses a plating bath contg. double- and single-Ni salts, NH_4Cl and H_3BO_3 and flat cast Ni anodes. Burning is prevented by use of a dummy consisting of Fe rods, upon which work rests. Oxide and blisters are overcome by buffing, scrubbing in benzine, and, after wiring, washing. Work is left in H_2O till it is to be plated. W. H. BOYNTON.

Effect of porosity upon the capacity of storage batteries. C. HEIM. *Elektrochem. Z.* 23, 281 (1915).—It is shown that the more rapid the diffusion of H_2SO_4 into the pores of the plates the longer it takes for the concn. of the H_2SO_4 in contact with the active material to fall below the allowed discharge value. Not only the quantity, therefore, but also the porosity of the active material is of importance. In his experiments H. made up 4 pastes containing the same amt. of Pb oxide and glycerol and different amts. of 22° Bé. H_2SO_4. After drying the grids filled with these pastes, the apparent vol. was the same in each case, but the wts. varied considerably. The wts. of H_2SO_4 used were in the proportion of *A* 100, *B* 121, *C* 143, *D* 171. Output tests were made against the same kind of negative plate and all other conditions were made uniform. It was found that *A* gave a rating of 28.5 amp. hr., *B* 30.2 amp. hr., *C* 32.3 amp. hr., and *D* 34.6 amp. hr. This shows an increased output of 21% for the most porous plate. W. E. RUDER.

Treatment of silver furnace fume by the Cottrell process. C. H. ALDRICH. *Trans. Am. Electrochem. Soc.* 28 (advance copy) (1915).—During the past 4 yrs. expts. were conducted at the Raritan Copper Works. The gases and fumes from the Doré refining furnaces were treated electrically (Cottrell process) and practically all of the values are now recovered. It was found that formerly even the water scrubber did not ppt. all of the Ag in the fumes on account of the tendency of the Ag to form metal fogs. The Cottrell treater is connected to the scrubber outlet. It consists of a rectangular cast-iron chamber, 2.4 m. × 1.8 m. × 4.8 m., set over a lead-lined hopper connecting with a sludge tank through a launder. Collecting electrodes are 15 cm. long Pb strips. The gases are extremely corrosive but Pb has proved entirely satisfactory under all conditions. The av. analysis of the dust deposited in the treater is: Se 6.5, Te 6.0, As 10.0, Sb 28.0, Pb 9.0, Bi 2.0, Cu 0.9%; Ag 800 oz. per ton; Au 1 oz. per ton. The cost of operating has been very low. 6000 cu. ft. of gas and fume are treated per min. The presence of suspended H_2O particles facilitates the elec. pptn., but injection of steam did not give satisfactory results. A second new treater consists of Pb pipes 3.6 m. long × 45 cm. in diam. containing a single central Pb discharge electrode. At 85,000 to 90,000 v. and a gas velocity of 1.35 m. per sec. over 99% of the fume was pptd. The transformer has five taps, from 50,000 up to 100,000 v.; very fine regulation of the voltage is thus made possible. C. G. F.

Arc phenomena. A. G. COLLIS. *Proc. Am. Inst. Elec. Eng.* 34, 2081–2100 (1915). —Expts. were conducted to det. the influence of different shapes of arcing contacts upon the disturbances following rupture of an a. c. circuit, with particular reference to oil switches. Various theoretical considerations are discussed with a view to modifying the design of oil switches so as to increase their rupture capacity and eliminate

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auxiliary devices. It is shown that an arc ruptured in oil is not at once damped out by the oil rushing between the contacts but a vaporized space is formed around the contacts, the intensity of which is proportional to the vol. of the force liberated. The question of external reactors is also discussed. Photographs of arcs under oil are given. W. E. RUDER.

Direct reading device for use in computing characteristics of vacuum tungsten lamps. J. F. SKOGLAND. Washington. Bur. Standards, *Sci. Paper* 253, 269–87(1915).—This is a sequel to *Sci. Paper* 238 (cf. *C. A.* 9, 549). The characteristic equations there derived have served as the basis in the construction of a chart of scales which evaluate any one of the variables (c. p., w. p. c., or v.) with a single setting to observed values at any w. p. c. within the range of the chart (0.7 to 2.05 w. p. c.). The chief advantage which this device possesses over other methods of characteristic evaluation is a great saving of time. C. G. F.

Reclaiming nickel anodes by welding. ANON. *Iron Age* 95, 1392(1915).—Prest-o-lite Co. autogenically welds scrap anodes. H. V. MAIN.

Open hearth *versus* electric furnace in the manufacture of steels (CORNELL) 9. Electric enameling oven 19. Ultraviolet rays from the oscillating spark (KOWALSKI) 14.

ARRHENIUS, S.: **Lehrbuch der Elektrochemie.** Uebers: von H. Euler. 3 Abdr. Leipzig: J. A. Barth. 305 ss. 9 M.

FOERSTER, F.: **Elektrochemie wässeriger Lösungen.** 2 Aufl. Leipzig: J. A. Barth. 804 ss. 31.50 M.

Brit., 11,823, May 13, 1914. GES. FÜR ELEKTRO OSMOSE. In **electric endosmose,** one or more constituents are sepd. from mixts. containing suspension colloids, emulsion colloids, true colloids, ionized or non-ionized dissolved substances, or members of 2 or more of these classes, by means of 2 or more diaphragms, the potentials of which are so selected that the constituents required are retained by the diaphragms while other constituents pass through under the action of elec. current. Ionized substances may be first removed, as from colloidal solns., by means of parchment or other indifferent diaphragms near the electrodes; or, in order to retain a certain amt. of acid or base, which furthers the subsequent sepn. of colloids, 1 diaphragm may be electro-positive or electro-negative, to accelerate the sepn. of acids or bases, resp. *E. g.*, with an animal bladder before the anode and parchment before the cathode, brine becomes alk. in the middle compartment. By removing acids and bases successively, first negative colloids and then positive ones may be caused to migrate. A fractionation of the ions may be effected by reason of their differing velocities of migration through a particular diaphragm. With a viscose diaphragm before the anode and parchment paper before the cathode, H_2SO_4 can be sepd. from lactic acid by passing through the viscose. Non-ionized dissolved substances migrate with H_2O and are thus sepd. Thus, sugar can be retained between an anode diaphragm of animal origin and a cathode diaphragm of viscose, while non-saccharine material migrates. Cf. *C. A.* 8, 2120.

Brit., 11,950, May 14, 1914. A. A. M. HANRIOT. In the **electrolytic production of metals,** AgCl, Cu glance, or cinnabar is placed on or otherwise in contact with a cathode in a soln. of 1 or more alk. salts, and thereby reduced to metal. The cathode may be a plate of the same metal as that obtained. For AgCl, Na_2CO_3 soln. is used; for Cu glance, Na_2SO_4 soln.; and for cinnabar, brine containing a little Na_2CO_3. In the 2 last-mentioned cases, S and H_2S are formed at the anode. Reference is made to the reduction of galena and Cu_2S in dil. H_2SO_4.

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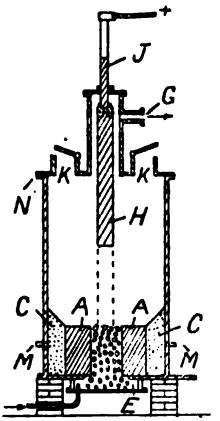
Brit., 12,057, May 15, 1914. G. COUTAGNE. **A furnace for making nitrides,** such as that of Al, is constructed as shown. A lower electrode, *A*, consists of a thick-walled vertical tube of C, round or polygonal, and sufficiently high to prevent overheating of its steel support. It is filled with coke and is sepd. by powdered Al_2O_3 and C from an otherwise unlined casing of wrought Fe or steel. The casing is made in annular or other disconnectible sections, which may themselves be in sep. parts, to allow of discharging, and is gas-tight so that N or producer gas can be forced in under pressure through the lower electrode, after passing through a distributing box, *E*. Residual gases escape through an opening, *G*, near the top of the casing. Insulating joints, *M*, *N*, are provided in the casing, preferably near its upper and lower ends. An upper electrode holder, *J*, enters through a stuffing box. At starting, the upper electrode *H* is lowered onto or into the coke within the lower electrode; when the coke is hot, gas is passed in, and small charges of a mixt.. of Al_2O_3 and C are introduced at intervals through holes, *K*, in the cover until the casing is full, the whole operation lasting some days. Continuous charging is also possible. C in excess of the theoretical proportion is supplied unless red bauxite is used. A layer of almost unchanged mixt. protects the casing and is afterwards added to fresh material for re-use. A crude nitride contains grains or small clusters of an alloy of Fe, Si and Al. These may be sepd. electromagnetically after crushing. Sepn. may be assisted by reduction of the alloy to dust by the action of H_2O or H_2O-vapor at atm. pressure. The powdered alloy may be added to fresh charges. Sepn. of the alloy is not necessary in the manuf. of NH_3, where the Al_2O_3 recovered is returned to the furnace. Crystals of carborundum, found near the electrodes, indicate the attainment of a temp. of at least 1950°.



Can., 163,922, July 27, 1915. S. PEACOCK. **Method of fixing atmospheric nitrogen,** by providing a mixt. of refractory oxide and C, the latter being present in such excess as to prevent the formation of CO_2 during the process, and subjecting said mixt. to a temp. sufficient to form a metallic nitride while air is fed to the mixt.

5. PHOTOGRAPHY.

LOUIS DERR.

BING, R.: **Ueber einige neue Isocyanine und deren Einwirkung auf Bromsilbergelatine.** Oldenburg: G. Stalling's Verlag. 71 ss. 4.50 M.

HÜBL, A. F. v.: **Three-Color Photography: with Special Reference to Three-Color Printing and Similar Processes.** Trans. by H. O. Klein. London: Lund, Humphries & Co.

TOWNSEND, C. F.: **Chemistry for Photographers.** London: Hazell, Watson & Viney. 1 s.

Brit., 9,929, Apr. 22, 1914. J. RHEINBERG. In the manuf. of **screens and screen plates for half-tone processes or color photography,** and in the production of color pictures made by multicolor screens, use is made of chem. changes caused in a colloid film coated with a resist vehicle, by the action of light which alters the permeability of the resist to solvents, whereby dyes or pigments can be extd. from the underlying film, or whereby the underlying film can be dyed through the permeable parts of the resist, without any

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removal of the superimposed resist. To produce a 3-color screen, a collodion film dyed red is coated with an albumin resist which is sensitized by immersion in H_2O containing green ferric NH_4 citrate and U nitrate. The plate is exposed under a black-line screen having 200 lines to the in., the black and white spacing being equal. The exposed lines on the resist are rendered more permeable to alc. solns., and the plate is immersed in acidified alc. to ext. the red dye from the exposed lines. The plate is then immersed in an alc. soln. of a green dye, by which means the clear lines from which the red dye has been extd. are dyed green, giving a screen of equally spaced red and green lines. The plate is then washed to remove the H_2O-sol. chemicals, resensitized with the same mixt., and exposed through a black-line screen with 200 lines to the in., the opaque lines being placed across the red and green lines. The plate is then treated in acidified alc. to remove the red and green dye from under the lines exposed through the screen, leaving red and green rectangular areas, each color occupying $^1/_3$ of the plate area. The plate is then immersed in an alc. soln. of violet dye to obtain violet lines. The whole of the resist may then be removed by warm H_2O, to which a little acid or alkali may be added. In lieu of starting with a colored film, a transparent film may be used and dyed up progressively. Various alternative substances for sensitizers are described, the governing condition being that both the underlying film and the resist vehicle must be permeable to the solvent used for extg. or conveying the dye to or from the underlying film. The underlying film may be of the same colloid as the resist vehicle, and the 2 films may be sepd. by a third film also permeable to the solvent used. In the application of the process to screen photographs, the color particles may be selectively removed from the screen in the white or light portions of the picture.

Ger., 283,149, Feb. 22, 1914. FARBW. v. M. L. & B. **A photographic developer** for plates, films, and developing out papers, which gives brilliant black shades. Solns. are prepd. by dissolving, in H_2O, the 1,4-dihydroxynaphthyl alkyl ethers, with the necessary amts. of neutral Na_2SO_3 and alkali, preferably with the addition of KBr. The alkali carbonates are preferred, but in place of these may be used aldehydes or ketones, especially HCHO or $(CH_3)_2CO$. *E. g.*, the developer is made of H_2O 100, $Na_2SO_3.7H_2O$, Na_2CO_3 (calcined) 5, KBr 1, 1,4-dihydroxynaphthyl ethyl ether 1. Normally exposed AgBr emulsion plates, films, or papers are completely developed in this soln. in about 3 min., whereupon they are fixed in the usual manner.

Ger., 283,205, Mar. 21, 1913. Addition to 280,679 (*C. A.* 9, 2356). CHEM. FABRIK AUF ACTIEN (v. E. SCHERING). **Selenium toning bath** for photographic Ag-pictures is made by dissolving 1 g. selenous acid in 100 cc. H_2O, and adding 5 cc. concd. HCl. In this bath, developed, fixed, and washed pictures on gas light paper or AgBr paper acquire a beautiful brownish tone. The white does not suffer by the operation, so that subsequent treatment is not required. All half-tones are retained, and the picture is not faded. Cf. *C. A.* 8, 2658.

Ger., 284,071, June 21, 1913. H. BECK and E. JACOBI. Photochemical production of **printing forms** from developed, fixed, washed, and heated gelatin-Ag-pictures. Upon drying, these negatives, under certain conditions, stand out in relief. Advantage is taken of this behavior in the production of printing plates. To prevent flowing of the gelatin film upon heating, it is first hardened with formalin and dried quickly with strong heating, as by laying it on a metal plate heated to 80–150°. The positive screen points project then sufficiently above the surface to serve as a printing surface. The after-treatment with $K_2Cr_2O_7$ may be dispensed with.

Holl., 3,111, Aug. 6, 1913. M. F. UNGERER. **Colored photographs** are produced by superimposing three pictures, taken through three-colored screens, each print being made on a sensitive coating, developed, and colored suitably. Cf. *C. A.* 9, 274.

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Holl., 3,356, Sept. 22, 1913. W. Willis. In the manuf. of paper making photographic prints, a very small addition of K_2PtCl_6 or other Cl compd. of Pt is added to paper which is prepd. with AgCl and $Fe_2(C_2O_4)_3$. Upon printing, the Pt compd. is reduced first. The resulting Pt appears to act as a catalyzer in the reduction of the Ag salt, so that after the development in $(KOCO)_2$ soln., very strong pictures are obtained, with a rich tone. Instead of incorporating the Pt compd. with the sensitive film, a small amt. of the Pt compd. may be added to the developer. The Cl compds. of Pt alone are suitable for the process, the HNO_3 compds. giving reddish tones. The required amt. of Pt salt is so small that it alone can hardly produce a picture. The prints obtained in this manner are exceptionally sharp and beautiful.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

Behavior of hydrogen peroxide with salts. P. V. Kazanetzkii. *J. Russ. Phys. Chem. Soc.* **46**, 1110–27(1914).—An exam. of the action of H_2O_2 on various salts gave the following results: The NH_4 salt previously obtained from $(NH_4)_2CO_3$ and H_2O_2 (*J. Russ. Phys. Chem. Soc.* **34**, 202(1902)) most probably has the compn. $(NH_4)_2CO_3.H_2O_2.H_2O$. When Cs_2CO_3 is dissolved in H_2O_2 (30%) at ordinary temp. the soln. gradually becomes hot and CO_2 is evolved. If, however, the soln. is cooled with NaCl + ice and cold alc. is added to it, a cryst. *salt* $Cs_2CO_3.2H_2O_2$ seps. out; it is unstable, gradually losing H_2O_2, is decompd. by H_2SO_4 with formation of O_3, reacts with $BaCl_2$, giving $BaCO_3$ and H_2O_2, liberates I from KI, slowly in neutral, and quickly in acid soln., reacts with titanic and chromic acids. The other alkali carbonates behave with H_2O_2 like Cs_2CO_3. The evolution of CO_2 at ordinary temp. is ascribed to perhydrolysis which changes the carbonates to bicarbonates. Basic $MgCO_3$ also dissolves in H_2O_2 with evolution of CO_2. If the resulting soln. is evapd. to dryness the *compound* $MgO_2.1/5MgCO_3.H_2O$ remains, but if it is evapd. in a desiccator at ordinary temp. the *compound* $3MgO_2.MgCO_3.H_2O_2$ is produced. These Mg compds. are quite stable, only very slowly losing active O. After 1.5 months the 2nd of the above Mg compds. still contained 17.04% of active O, while freshly prepd. it contains 19.59%. Hence this compd. contains more active O than any of the hitherto known Mg peroxides. The solubility of basic $MgCO_3$ in H_2O_2 soln. (30%) is 40 times greater than in pure H_2O. Basic $ZnCO_3$ behaves with H_2O_2 like basic $MgCO_3$, but the resulting soln. cannot be evapd. to dryness without causing an explosion. By concn. of the soln. to a small bulk only, what seems to be $ZnO_2.H_2O_2$ is formed. From $CdCO_3$ and H_2O_2 no peroxide could be prepd. $Zn(NO_3)_2$ and $ZnCl_2$ also seem to react with H_2O_2 with formation of peroxide. The reaction of $Bi(NO_3)_3$ with H_2O_2 gives an insol. mixt. of $BiONO_3.H_2O$ and $(BiONO_3)_6.H_2O_2$. Part of the latter remains in the soln. Upon heating to 110° the mixt. loses all of the H_2O_2. K_2SO_4, KCl and KNO_3 are more sol. in H_2O_2 than in H_2O. The solubility curve for K_2SO_4 in H_2O_2 soln. is almost a straight line. The increase in the solubility of salts in H_2O through the addition of H_2O_2 is due to the formation of perhydrates in which H_2O_2 plays the part of H_2O of hydration. This is corroborated by the cryoscopic detns. of Jones (*Am. Chem. J.* **30**, 205) and by those K. made with K_2SO_4. It is further corroborated by detns. of the elec. cond. of K_2SO_4 in H_2O_2 solns. of varying concns., which showed that the sp. cond. of K_2SO_4 decreases with the concn. of H_2O_2 down to a certain minimum, when it begins to rize. The work contains several tables and curves. H. M. Gordin.

Behavior of carbon dioxide in pure aqueous and saline solutions. E. Wilke. *Chem. Ztg.* **39**, 309(1915).—The general assumption that CO_2 solns. contain the hydrate

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H_2CO_3 is not in accord with the probability that the substance, being hydroxyformic acid, would exhibit strong acidic properties. A redetn. of the elec. cond. of solns. of CO_2 confirmed the values for the dissoc. const. (2.89×10^{-7}) previously found by Walker (*J. Chem. Soc.* 77, 1(1900)). Changes in cond. are effected by contact with metals. The dissoc. of H_2CO_3 in salt solns. was studied by detg. the H-ion concn., using H under pressure as electrode. Carbonic acid was found to be a much stronger acid under these circumstances than in pure aq. soln. The conclusion is drawn that in pure aq. soln. a higher hydrate, possibly $C(OH)_4$, which is a very feeble acid, is produced; the dehydrating action of salt solns. causes the formation of the more strongly acid hydrate, HO.COOH, from the higher hydrate. BERMAN.

Derivatives of perceric oxide. C. C. MELOCHE. *J. Am. Chem. Soc.* 37, 2338–46 (1915).—A strong soln. of $Ce(NO_3)_3$ was added to an excess of satd. K_2CO_3 contg. H_2O_2, the mixt. was heated to 60° and kept there until the color no longer deepened, after which CO_2 was passed into the soln. while it gradually cooled to 0°. The stream of CO_2 was continued as long as $KHCO_3$ could be pptd. The ppt. was then rapidly filtered off, the liquid warmed to redissolve any Ce compd. which might have pptd. (since this would not have been caught by the glass wool used as a filter), and the colored liquid allowed to stand 24–48 hrs. Red crystals of $Ce_2O_4(CO_3)_2.4K_2CO_3.12H_2O$ were formed and filtered off. If exposed to the air for a time, or left in a desiccator for a few min., the crystals changed from the transparent ruby-red to opaque orange. The available O in the compd. has been detd. by treatment with excess H_2SO_4 and measuring the O liberated, from which it was found that 2 atoms are liberated for each mol. of the compd. taken. The available O which remains after treatment with dil. H_2SO_4 was detd. by treatment with excess $FeSO_4$ and titrating the excess with $KMnO_4$. This showed a third atom of O in soln. which was available for oxidation. The available O remaining in soln. after treatment with H_2SO_4 was in the form of H_2O_2, as was shown by treatment with $Ti_2(SO_4)_3$. No $Ce(SO_4)_2$ was present, since the soln. lacked its characteristic yellow color. An iodometric method (after Kingzett) was able to detect only $^2/_3$ of the total available O. Discordant results were obtained in an attempt to det. the total available O with Mohr's salt. Other perceric compds. will be described in a future paper. E. B. MILLARD.

Reactions between cobaltous oxide and aluminium oxide at high temperatures. J. A. HEDVALL. Upsala. *Arch. für. Kem. Min. Geol.* 5, No. 16, 10 pp. (1914); cf. *C. A.* 8, 1715, 1936.—Mixts. of CoO and Al_2O_3 in varying proportions were heated in KCl as a flux. At temps. up to 1100° a compd., $CoAl_2O_4$ (Thenard's blue), is formed. At 1300–1400° a green product is formed, analyses of which indicate a compd., $4CoO.3Al_2O_3$, in which small amts. of CoO are invariably dissolved. Upon reheating in KCl to 1100° these products give the blue aluminate. Both the blue and green products are insol. in acids and bases but are decompd. by $KHSO_4$ and by heating in a closed tube to 210° with a mixt. of 8 pts. concd. H_2SO_4 and 3 pts. H_2O. The particles of the products were so small that it could not be detd. whether or not they were crystalline. A. R. MIDDLETON.

Reaction between stannic oxide and cobaltous oxide at high temperatures. J. A. HEDVALL. Upsala. *Arch. für. Kem. Min. Geol.* 5, No. 18, 7 pp. (1914); cf. preceding abstr.—By the same methods previously employed H. finds that mixts. in all proportions of CoO and SnO_2, when heated to 1100° or 1300–1400°, form one compd. only, the *orthostannate*, Co_2SnO_4, and not a metastannate as stated in the literature. It is dark blue-green, readily attacked by acids, less readily by alkalies, finely cryst., d_{18} 6.30. The metastannate obtained by pptn., $CoSnO_3.6H_2O$, pale red, upon ignition, becomes pink, ruby-red, then black, and at red heat green, at higher temp., bright green-blue. The microscope showed this ignited product to be a mixt. of SnO_2 and

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the orthostannate. This was confirmed by analysis. Also in *Z. anorg. allgem. Chem.* **92**, 369–75(1915). A. R. MIDDLETON.

Borates. The system Na_2O–B_2O_3–H_2O at 60°. I. U. SBORGI AND F. MECACCI. Univ. Pisa. *Atti accad. Lincei* **24**, I, 443–8(1915).—In preceding papers (*C. A.* **7**, 1685, 3092; **8**, 3164) the sytem B_2O_3–H_2O with alkali and alk. earth oxides at 30° was studied in order to det. the exact compn. of borates formed as stable phases. The system Na_2O–B_2O_3–H_2O had been studied by Dukelski (*Z. anorg. Chem.* **50**, 38(1906)) at 30° and S. has studied the same system at 60°. The Na borates previously reported are listed; if the figures represent the number of mols. of Na_2O, B_2O_3 and H_2O, resp., in these compds. the known borates are as follows: 1–1–4, 1–1–4.5, 1–1–5.5, 1–1–6, 1–1–8, 1–2–4, 1–2–5, 1–2–10, 1–3–X, 1–4–10, 1–5–10, 1–6–12, 2–5–X. Dukelski confirmed the existence of 1–1–4, 1–1–8, 1–2–10 and 1–5–10 as stable solid phases. The methods of experimentation in the study of this system are the same as those previously used. 54 expts. were made (many of them in duplicate) with mixts. of various compn. and they were all agitated in the thermostat from 1 to 60 days. Besides H_3BO_3 the pentaborate decahydrate, 1–5–10, and the diborate pentahydrate, 1–2–5, were the only stable solid phases at 60° reported in this paper. The results are sharp and definite for these. Other results were obtained with diborate for which diagrams will be published later. E. J. WITZEMANN.

Tetrathionates. F. CALZOLARI. Univ. Ferrara. *Atti accad. Lincei* **24**, I, 921–5 (1915).—A comparison of the formula of persulfuric acid, $H_2S_2O_8$, with that of tetrathionic acid, $H_2S_4O_6$, shows that the latter may be derived from the former by substitution of 2 O atoms with 2 S atoms. And if the latter has the constitution assigned by Blomstrand and by Mendeléeff, $(S\text{-}SO_3OH)_2$, its analogy with the former $(O.SO_3OH)_2$ is evident. Chemically the salts of the 2 acids show analogies: $K_2S_4O_6$ forms anhydrous crystals and is a little sol. in H_2O like $K_2S_2O_8$; $Na_2S_4O_6$ and $Na_2S_2O_8$ give anhydrous crystals and are very sol.; BaS_4O_6 has 3 H_2O of crystn. and is sol.; BaS_2O_8 is more sol. and has 3–4 H_2O of crystn., but cannot be obtained pure; PbS_4O_6 has 2 H_2O of crystn., while PbS_2O_8 has 3 H_2O. The comparison cannot be extended because of the lack of data on the tetrathionate. Barbieri and C. (*C. A.* **5**, 3771) describe a number of persulfates of bivalent metals in combination with NH_3, C_5H_5N and hexamethylenetetramine. C. has now prepared the corresponding derivs. of $H_2S_4O_6$ and found that the 2 series are entirely similar in compn., in the degree of hydration, in appearance and in solubility. BaS_2O_3, obtained as a ppt. by mixing cold satd. solns. of $Na_2S_2O_3$ and $BaCl_2$, was suspended in a little H_2O and treated with the calcd. amt. of I and BaS_4O_6 pptd. by adding EtOH. The solns. of Mg, Zn, Cd, Ni and Cu tetrathionates were prepared by treating BaS_4O_6 with the corresponding sulfate. *Zinc-ammonia tetrathionate*, $ZnS_4O_6.4NH_3$, is obtained from strongly ammoniacal solns. of ZnS_4O_6, as colorless transparent crystals; *nickel-ammonia tetrathionate*, $NiS_4O_6.6NH_3$, lilac microscopic prisms, was obtained similarly from NiS_4O_6 solns. Ten % solns. of ZnS_4O_6 treated with excess C_5H_5N sepd. *zinc-pyridine tetrathionate*, $ZnS_4O_6.4C_5H_5N$, as colorless prismatic crystals. *Cadmium-pyridine tetrathionate*, $CdS_4O_6.4C_5H_5N$, was obtained similarly as colorless prisms. A concd. soln. of CuS_4O_6 treated with C_5H_5N sepd. *copper-pyridine tetrathionate*, (*a*), $CuS_4O_6.4C_5H_5N$, as a microcryst. powder. Using 1% solns. of CuS_4O_6 and H_2O solns. of C_5H_5N the (*a*) was obtained as deep blue cryst. needles, stable in air, quite insol. in cold H_2O and decompg. losing C_5H_5N in hot. *Nickel-pyridine tetrathionate*, $NiS_4O_6.4C_5H_5N$, was obtained as blue cryst. needles. *Cobalt-pyridine tetrathionate*, $CoS_4O_6.4C_5H_5N$, sepd. as rose-violet, needle-like crystals. The hexamethylenetetramine addition products were obtained by treating solns. of $C_6N_4H_{12}$ with solns. of the tetrathionates. They are well crystd. compds., stable in the air and sol. in cold H_2O; *magnesium-hexamethylenetetramine tetrathionate hydrate*, MgS_4O_6.-

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$8H_2O.2C_6N_4H_{12}$, transparent colorless prisms; *nickel-hexamethylenetetramine . tetrathionate hydrate*, $NiS_4O_6.8H_2O.2C_6N_4H_{12}$, green transparent prisms; *cobalt-hexamethylenetetramine tetrathionate hydrate*, $CoS_4O_6.8H_2O.2C_6N_4H_{12}$, rose prisms, the latter deriv. forms solid solns. with the 2 preceding. The persulfate derivs. have the same compn. as all the above except that S_2O_8 replaces S_4O_6. E. J. WITZEMANN.

Halomercuriates. F. CALZOLARI AND U. TAGLIAVINI. Univ. Ferrara. *Atti accad. Lincei* 24, I, 925–32(1915).—Many physico-chem. researches have been made on the complexes that Hg^{II} forms with the halogen ions but the results are not decisive nor concordant. It is clear, however, that the halomercuriates existing in soln. are quite simple. Le Blanc and Noyes (*Z. physik. Chem.* 6, 390 (1890)) found Na_2HgCl_4 in solns. of NaCl + $HgCl_2$ while in solns. of KCl + $HgCl_2$ the Hg is bound to more than 4 atoms of Cl and according to Benrath (*C. A.* 2, 2488) K_4HgCl_6 is formed. C. and T. detd. to study the state of the halomercuriate derivs. in soln. by isolating the addition compds. with $C_6N_4H_{12}$ by the method used by Barbieri with CaS_x (*C. A.* 9, 896). The preliminary results are given below. The halomercuriates of Li, Mg, Mn, Co and Ni were studied and the $C_6N_4H_{12}$ derivs. were easily obtained. They are little sol., beautifully cryst. and stable in air, in which they differ from the corresponding hydrates which are extremely sol. and hygroscopic and difficult to prepare. Solns. of $HgCl_2$ + LiCl and $HgCl_2$ + LiBr did not give a cryst. compd. even on evapn. but the $C_6N_4H_{12}$ addition compds. were easily obtained (cf. below). Duboin (*C. A.* 3, 1256) found that a soln. of HgI_2 + LiI (d. 3.28) gave after 3 months hygroscopic crystals of $2LiI.HgI_2.8H_2O$; the $C_6N_4H_{12}$ deriv. was easily obtained. The Mg derivs. known are $MgCl_2.3HgCl_2.6H_2O$, $MgCl_2.HgCl_2.6H_2O$, $MgI_2.HgI_2.9H_2O$ and $MgI_2.2HgI_2.7H_2O$; for Mn they are $MnI_2.HgI_2.6H_2O$ and $3MnI_2.5HgI_2.20H_2O$; for Ni and Co they are $NiI_2.2HgI_2.6H_2O$, $NiI_2.HgI_2.6H_2O$, $CoI_2.2HgI_2.6H_2O$ and $CoI_2.HgI_2.6H_2O$. In the $C_6N_4H_{12}$ derivs. of halomercuriates of Mg, Mn, Co, Ni and Li all contain 2 mols. $C_6N_4H_{12}$ and 10 of H_2O except those of Li, which contain 8; (2) there are 2 simple types of halomercuriates, $[HgX_3]M^I$ and $[HgX_4]M_2^I$. The bromomercuriates of Mg, Mn, Co and Ni are of the 1st type and the iodomercuriates of Ni and Co and the halomercuriates of Li are of the 2nd, while the iodomercuriates of Mg and Mn show both types. To a very concd. soln. of LiCl (8 mol.) + $HgCl_2$ (1 mol.) was added a very concd. soln. of $C_6N_4H_{12}$ and after some hrs. colorless transparent crystals of *lithio-hexamethylenetetramine chloromercuriate*, $2LiCl.HgCl_2.8H_2O.2C_6N_4H_{12}$, sep. On evapg. slowly a soln. containing 1 mol. $HgBr_2$ + 4 mols. LiBr + 4 mols. $C_6N_4H_{12}$, large colorless prisms of *lithio-hexamethylenetetramine bromomercuriate*, $2LiBr.HgBr_2.8H_2O.2C_6N_4H_{12}$, sep.; *lithio-hexamethylenetetramine iodomercuriate*, $2LiI.HgI_2.8H_2O.2C_6N_4H_{12}$, transparent crystals, was obtained similarly. *Magnesio-hexamethylenetetramine chloromercuriate*, $MgCl_2.2HgCl_2.10H_2O.2C_6N_4H_{12}$, seps. from a concd. soln. containing 1 mol. $MgCl_2$, 8 mols. KCl, 2 mols. $HgCl_2$, and 2 mols. $C_6N_4H_{12}$, as colorless transparent crystals, sol. in concd. alkali chlorides but decompd. in pure H_2O; similarly *magnesio-hexamethylenetetramine bromomercuriate*, $MgBr_2.2HgBr_2.10H_2O.C_6N_4H_{12}$, colorless prisms, with same properties as preceding. To 140 cc. H_2O containing 5 g. $MgSO_4.7H_2O$, 9 g. HgI_2 and 12 g. NaI were added 5.6 g. $C_6N_4H_{12}$ in 60 cc. H_2O and *magnesio-hexamethylenetetramine iodomercuriate*, $MgI_2.HgI_2.10H_2O.2C_6N_4H_{12}$, sepd. as a slightly yellow cryst. powder; the mother liquor sepd. on evapg. slowly colorless prisms of $MgI_2.2HgI_2.10H_2O.2C_6N_4H_{12}$ analogous to the preceding. The Mn derivs. were obtained similarly: *manganese-hexamethylenetetramine chloromercuriate*, $MnCl_2.2HgCl_2.10H_2O.2C_6N_4H_{12}$, colorless transparent prisms; *manganese-hexamethylenetetramine bromomercuriate*, $MnBr_2.2HgBr_2.10H_2O.2C_6N_4H_{12}$, transparent colorless prisms which brown slowly in the air. The analogous derivs. of Co were prepared similarly: *Cobalto-hexamethylenetetramine chloromercuriate*, $CoCl_2.2HgCl_2.10H_2O.2C_6N_4H_{12}$, rose prisms; *cobalto-hexamethylenetetramine*

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bromomercuriate, $CoBr_2.2HgBr_2.10H_2O.2C_6N_4H_{12}$, rose crystals; ***cobalto-hexamethylenetetramine iodomercuriate***, $CoI_2.HgI_2.10H_2O.2C_6N_4H_{12}$, rose crystals; only 1 iodo deriv. could be sepd. The same derivs. of Ni were similarly obtained: ***nickel-hexamethylenetetramine chloromercuriate***, $NiCl_2.2HgCl_2.10H_2O.2C_6N_4H_{12}$, green prisms; ***nickel-hexamethylenetetramine bromomercuriate***, $NiBr_2.2HgBr_2.10H_2O.2C_6N_4H_{12}$; ***nickel-hexamethylenetetramine iodomercuriate***, $NiI_2.HgI_2.10H_2O.2C_6N_4H_{12}$, green transparent crystals.

E. J. WITZEMANN.

Magnesium amalgam. L. CAMBI AND G. SPERONI. Milan. *Atti accad. Lincei* 24, I, 734–8(1915).—In continuing the expts. on the amalgams of the alk. earths (*C. A.* 9, 1880) the present paper is a report on the Mg amalgams. The methods were the same as those previously used. The amalgams were prepared by dissolving clean bits of Mg in boiling Hg in Jena glass in a N_2 atm. The Mg was 99% Mg and 0.36% Al + Fe. Amalgams with more than 20 at. % Mg were prepared quantitatively directly by heating the Hg and Mg in a sealed tube at 390–400° for 36–48 hrs. Amalgams with more Mg than 1 Mg : 1 Hg were difficult to obtain as uniform melts at atm. pressure and are not included in this study. The thermal analysis was carried out in the same app. used for Ca-Hg and the amalgams were kept in an atm. of dry CO_2. Two series of readings were made: (1) by direct reading, (2) by a registering galvanometer. In many cases the Mg content of the alloy was detd. quantitatively after completing the expts. The data show the presence of the compds. $MgHg_2$ (m. with decomp. 168°) and MgHg, which represents the highest Mg concn. used. At a concn. of 30 at. % of Mg the m. p. of the amalgam exceeds the b. p. (415°) of Hg and fusion beyond this point was incomplete at atm. pressure. Kerp, Böttger and Iggena (*Z. anorg. Chem.* 25, 33(1900)) found that 1% Mg by wt. is sol. in Hg at 300°, but C. and S. found 3.88% sol. at 280°. 0.313 at. % Mg is sol. in Hg at 17°. The systems Ca–Hg and Mg–Hg show certain analogies, but Mg is more sol. in Hg ($MgHg_3$) than Ca ($CaHg_4$). At 109° 0.63% Ca by wt. are sol. and 1.34% Mg. The Ca–Hg that boils at atm. pressure contains 13–14 at. % Ca while with Mg–Hg it has 32–4 at. % Mg. Thermal analysis does not confirm the existence of $MgHg_6$ and $MgHg_4$ found by K., B. and I. The compd. $MgHg_2$ is analogous to $MgZn_2$ while MgHg is like MgCd. The following formulas show the analogies: $NaHg_4$, $NaCd_4$; KHg_6, KCd_{11}; $MgHg_2$, MgCd, $MgZn_2$, $CaHg_4$, $CaCd_3$, $CaZn_{10}$ and $CaZn_{11}$.

E. J. WITZEMANN.

Iron carbides and their catalytic action on the decomposition of carbon monoxide. S. HILPERT AND T. DIECKMANN. *Ber.* 48, 1281–6(1915).—According to Boudouard, the oxides of Fe, Co and Ni are the principal factors in the decompn. of CO; according to Schenk and Zimmermann, the free metals, not the oxides, act as catalysts. In their expts. H. and D. confine themselves to a study of the catalyst. In every case pure Fe_2O_3 which had been previously heated was used. The CO was carefully purified and dried. At 950° the tendency of CO to sep. C is very slight. In spite of this, it is surprizing that at this temp. the oxide is reduced to pure Fe. After 10 hrs. at this temp. a grayish metallic product was obtained which analyzed 99.8% Fe. At 850° the formation of carbide occurs rapidly and at the same time the sepn. of C occurs. Below 800° the sepn. of C occurs very rapidly. The evident conclusion is that not the Fe itself but a carbide hastens the reaction. The material showed no trace of magnetic properties at 200°. Since pure Fe loses its magnetic property at 750° and the carbide at 200°, only the carbide could have acted as catalyst. The mechanism of the process probably is that the apparently stable carbide Fe_3C is broken up by the action of CO into a series of compds. rich in C, such as Fe_2C and FeC. These are very unstable and tend to form Fe_3C again with the sepn. of C.

L. T. FAIRHALL.

Reduction of phosphorous halides. I. Action of mercury on phosphorus halides. The preparation of 100% red phosphorus. L. WOLF. *Ber.* 48, 1272–80(1915).—Hg

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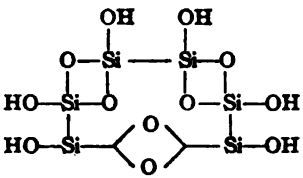
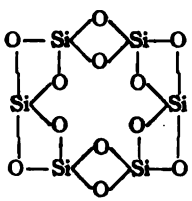
shaken with PBr_3 at room temp. gives a grayish green substance, which at 40° turns yellow and at 80° dark red. In the prepn. of pure red P, the components of this reaction are heated for two days at 100°, then heated one day longer at 130°, extd. with abs. Et_2O and the $HgBr_2$ sublimed in an O-free CO_2 atm. The substance left contains about 87% red P. This is placed in a bomb tube projecting about $^1/_3$ of its length from the oven, a few drops of PBr_3 are added and the tube evacuated. The tube is heated for 24 hrs. at 220–40°. $HgBr_2$ sublimes to the cooler end. The product is extd. with Et_2O and Hg dist. off at 250° and 25–30 mm. pressure. If the product is not of the highest purity, it is again treated with PBr_3 and heated as above. The red P thus obtained is exceedingly pure. It scarcely darkens in contact with NH_4OH. Its ignition temp. is about 300°. The reduction of PCl_5 with Hg is not practicable as the Hg is oxidized to the HgCl stage only. There is no further reaction between HgCl and PCl_5 but rather a tendency for the HgCl and P to react, yielding Hg and PCl_3. L. T. FAIRHALL.

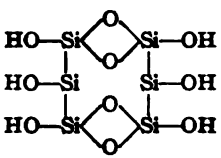
The constitution of silica, silico-oxalic acid and meso-silico-oxalic acid. G. MARTIN. *Chem. News* 112, 61–3(1915).—From the manner in which silico-oxalic acid and meso-silico-oxalic acid are synthesized and from the fact that both yield SiO_2 identical in its phys. and chem. aspects, M. suggests the following structural formulas:



Silico-oxalic acid.



Silica.



Meso-silico-oxalic acid.

In the above structural formula, the minimum mol. wt. assigned to silica is $6SiO_2$. It is improbable that it is less than this and since silica has a well defined cryst. structure, it is improbable that it is a substance of great molecular complexity. The tendency of Si atoms to condense in groups of 6 has been shown in a number of compds., *e. g.*, feldspar, certain org. Si compds., etc. Expts. made to isolate synthetic silicic acids of known constitution lead to the conclusion that Si atoms which are directly united retain OH groups with much greater stability than do Si atoms which are united through O atoms. The following definite rules may be considered as exptly. established: (*A*) A chain of Si atoms united through O atoms, thus, –O–Si–O–Si–O–, cannot have attached to any single Si atom even a single OH group which is stably enough united to bear desiccation over H_2SO_4 or drying at 100°. (*B*) A chain of the two Si atoms directly united, thus, Si–Si, can bear attached to each Si atom at ordinary temp. *only one* OH group which will stand desiccation as above. (*C*) A chain composed of three Si atoms directly united, thus, Si–Si–Si, can bear attached to the outer Si atom *only one* OH group, while the interior Si atoms can bear *two* OH groups capable of being retained on desiccation as above. L. T. FAIRHALL.

Changes of color in solutions of cobalt chloride. A. KOCHUBEI. *J. Russ. Phys. Chem. Soc.* 46, 1056–67(1914).—The color of $CoCl_2$ solns. changes with the concn., the temp. and the presence of foreign substances. Ascribing the change in color to changes in the state of hydration of the salt, and leaving the exam. of the other factors for a future date, K. detd. the hydrations of the ions at different concns. by Nernst's method (*Theoret. Chem.*, 7th edit., 409), using as cathode a thin strip of Co, and as anode a coil of Ag gauze. The concn. varied between 6 and 15%. The results may thus be

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summarized: In H_2O the hydration of $CoCl_2$ as well as of its ions decreases when the concn. increases, the $Co(H_2O)n$ ions probably changing to $Co_4(H_2O)n$, $Co_4(H_2O)$ and $Co(H_2O)_2Cl_2$, but there is no formation of $CoCl_4$ ions, as is assumed by some investigators. The blue color of $CoCl_2$ in alc. doubtless is due to complexes, such as $CoCl_2(EtOH)_2$, divalent ions $CoCl_4$, etc. Whether the latter are produced upon the addition of HCl, NaCl, KCl, NH_4Cl, $BeCl_2$, $MgCl_2$, $CaCl_2$, $SrCl_2$ or $AlCl_3$ to the aq. soln. of $CoCl_2$ has so far not been detd. with certainty. In the red solns. of $CoCl_2$ containing $ZnCl_2$, $CdCl_2$, $SbCl_3$, $HgCl_2$ or $SnCl_2$ the presence of complex ions may be regarded as proved. The compn. of these is probably: $\left[CO \cdot \begin{matrix} Cl_4 \\ (ZnCl_2)_2 \end{matrix}\right]''$, $\left[CO \cdot \begin{matrix} Cl_4 \\ (HgCl_2)_2 \end{matrix}\right]''$, etc.

H. M. Gordin.

Metallo-compounds of cobalt and nickel. S. U. Pickering. *J. Chem. Soc.* 107, 942–54(1915).—Both Co and Ni form compds. closely analogous to the cupri-compds., which are characterized by great depth of color and soly., and by containing the metal in the anion, as is proved by electrolysis. In all these cases double carbonates and citrates, as well as the single tartrates, racemates, malates, citrates and glycerates, exist in soln. as metallo-compds. from which the solid metallo-compd. can (in most cases) be pptd. by EtOH. In soln. these metallo-compds. gradually change into the corresponding, less sol. normal salts, which then crystallize. Organic salts of all 3 metals dissolve in alkali hydroxides, and yield compds. of which the 2 which have been isolated in the case of Co are similar to 2 isolated in that of Cu. The color intensity of solns. of inorganic salts of the 3 metals is not affected (except in the case of very concd. solns. of Co) by dilu., but that of the org. salts decreases on dilu. Several cases occur, with all 3 metals, of compds. existing in the form of jellies, and, apparently, in the case of Ni the normal salts can exist in this state. Two metameric forms of normal Co racemate have been obtained. (Author's abstract.) L. T. Fairhall.

Metallo-compounds in solution. S. U. Pickering. *J. Chem. Soc.* 107, 955–9 (1915).—The great color intensity of solns. of Cu and Co salts of org. acids and the variation in the intensity with the concn. are explained by the co-existence in soln. of the two forms of the compd., the normal salt with low color-intensity and a cupri- or cobalti-compd. with a color intensity about 20 times greater. The metallo-compds. may be obtained by evapn. or by pptn. with EtOH. When solid they form clear glasses or scales. Those obtained by pptn. are often sol. to an indefinitely great extent. K cupricitrate yields both the normal and metallo-compd. on evapn. Evapn. of various solns. containing metallo-compds. or normal salts shows that, with few irregularities, scales or glass are obtained from those compds. which according to the color intensity are rich in the cupri-compd. and crystals from those rich in the normal salt. The change of the metallo-compd. into the normal salt is reversible, as normal citrates of Co and Ni form solns. which yield only the metallo-compd. on evapn. or pptn. with EtOH. The pptn. of the metallo-compd. from soln. as an emulsion may be brought about by mixing two aq. salt solns. (as in the case of potassium manganotartrate) and in a more novel manner in the case of the metallo-citrates merely by boiling the concd. soln. In some cases the emulsion has only a transitory existence but when once obtained and dried is generally permanently stable. L. T. Fairhall.

Chromisalicylic acid and its ammoniacal derivatives. G. A. Barbieri. Univ. Ferrara. *Atti accad. Lincei* 24, I, 605–10(1915).—In a preceding note (*C. A.* 9, 1477) the constitution of some complex salicylates was interpreted as being similar to that of the chromioxalates, $\left[M^{II}\left(\begin{matrix} O.C_6H_4 \\ | \\ O.CO \end{matrix}\right)_2\right]R_2$ in which M^{II} = Cu^{II}, Pd^{II} and $V^{IV}O$ and

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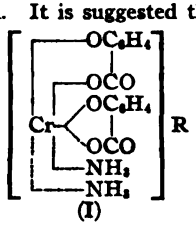
R = alk. metal or NH_4 like $\left[Cr\left(\begin{matrix}O.CO\\|\\O.CO\end{matrix}\right)_3\right]R_3$. This interpretation was confirmed by the study of compds. described in this paper. Chrome alum reacting with an alk. salicylate gives a yellow powder, insol. in H_2O and org. solvents, sol. in alk. carbonates, in NH_4OH and C_5H_5N; the analysis corresponds to $\begin{matrix}H_4C_6O\\|\\OCO\end{matrix}\!\!>\!Cr.OC_6H_4CO_2H.3H_2O$ which is the chromisalicylic acid (*a*) corresponding to the ferrisalicylates of Weinland and Herz (*C. A.* 8, 61). The NH_3 derivs of (*a*) are of special interest. From solns. of (*a*) in concd. NH_4OH a rose-violet compd. (*b*) seps. slowly as microscopic needles with the compn. $\begin{matrix}H_4C_6O\\|\\OCO\end{matrix}\!\!>\!Cr.OC_6H_4CO_2H.3NH_3.3H_2O$. Solns. of (*b*) treated with KCl, NaCl and $AgNO_3$ gave salts by substituting K, Na and Ag for NH_3. In these derivs. there is a Cr complex containing 2 mols. salicylic acid and 2 mols. NH_3 which is common to all, and since the coördinating valence of Cr is 6 and Cr gives regular satd. coördinated compds., and since the Ag salt is anhydrous (cf. formula below) the H_2O of crystn. is not part of the complex anion. It is suggested that the derivs. correspond to (I),



(I)

and thus belong to the tetraaciddiamino salts and, according to Werner, should be called *disalicylatodiamminechromiates*. They are analogous to the dioxalo-diamminechromiates $\left[Cr\begin{matrix}(C_2O_4)_2\\(NH_3)_2\end{matrix}\right]R$, (Clève, *K. Vet. Akad. Handl.* 6, 24 (1865)) and the dioxalo-diamine-cobaltiates, $\left[Co\begin{matrix}(C_2O_4)_2\\(NH_3)_2\end{matrix}\right]R$. The salts of (*a*) treated with dil. acids give the free acid (*a*), insol. in H_2O. (*a*) is also obtained by heating the NH_4 salt (*b*). The H_2O of cryst. is also lost at the same time. B. has not detd. the constitution of the yellow powder (*a*), but it may be that given above or $\left[Cr_3\begin{matrix}(C_6H_4(OH)CO_2)_6\\(OH)_2\end{matrix}\right]\left[Cr\left(C_6H_4\begin{matrix}O\\\diagdown\\CO_2\end{matrix}\right)_2.10H_2O,\right]$ which is the salt of chromisaliyclic acid with hexasalicylatotrichromi base like that found for Fe by Weinland and Herz. A cold soln. of Cr^{III} salt reacting with 3 mols. of an alk. salicylate gives a yellow product (*a*) which is friable in the cold and soft and viscous in the warm, gives a green color in alk. carbonates and a violet color with NH_3 and C_5H_5N. 40 g. (*a*) in 200 cc. 15% NH_4OH give a violet liquid which on cooling seps. *ammonium disalicylatodiamminechromiate*, $\left[Cr\left(\begin{matrix}OC_6H_4\\|\\OCO\end{matrix}\right)_2(NH_3)_2\right]NH_4.3H_2O$, rose microscopic needles, yield 30 g. The violet aq. soln. becomes greenish on standing but violet again on adding NH_3. If to a concd. strongly ammoniacal soln. of the above a satd. soln. of KCl is added, a cheesy red ppt. of *potassium disalicylatodiamminechromiate*, $\left[Cr\left(\begin{matrix}OC_6H_4\\|\\OCO\end{matrix}\right)_2(NH_3)_2\right]K.5H_2O$, is obtained. Similarly with NaCl

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or Na_2SO_4 *sodium disalicylatodiamminechromiate,* $\left[Cr\left(\begin{matrix}OC_6H_4\\|\\OCO\end{matrix}\right)_2(NH_3)_2\right]Na.6H_2O$, was obtained. 5 g. (*a*) digested with a 2% $AgNO_3$ soln. gave *silver disalicylatodiamminechromiate,* $\left[Cr\left(\begin{matrix}OC_6H_4\\|\\OCO\end{matrix}\right)_2(NH_3)_2\right]Ag$, in which the appearance of the crystals remains unchanged. E. J. WITZEMANN.

Potassium ammonobarate, ammonostrontiate and ammonocalciate. E. C. FRANKLIN. *J. Am. Chem. Soc.* 37, 2295–2301(1915).—When a Ba salt and an excess of KNH_2 are brought together in liquid NH_3, a ppt. of *potassium ammonoborate,* $BaNK.2NH_3$ (or $Ba(NH_2)_2.KNH_2$), was obtained. Temps. up to 100° have no effect upon the compd.; it is insol. in NH_3, but is decomposed and dissolved in NH_3 solns. of NH_4NO_3. On contact with H_2O it is hydrolyzed vigorously into KOH, $Ba(OH)_2$ and NH_3. $Ba(NH_2)_2$ may be prepd. by the action of KNH_2 on $Ba(NO_3)_2$ in NH_3 or (in an impure form) from $Ba(SCN)_2$ and KNH_2 in NH_3. *Potassium ammonostrontiate,* $SrNK.2NH_3$, or $Sr(NH_2)_2.KNH_2$, or $[Sr(NH_2)_3]K$, was prepd. in the same way as the Ba compd., and *calcium ammonocalciate* by the action of KNH_2 on metallic Ca or by adding Ca $(SCN)_2$ to an excess of a soln. of KNH_2. Another formula generally applicable to all 3 salts was $NH_2CaNHK.NH_3$. E. B. MILLARD.

Compounds of vanadylurea. G. A. BARBIERI. Univ. Ferrara. *Atti accad. Lincei* 24, I, 435–8(1915).—The work of Piccini (*Z. anorg. Chem.* 11, 106; 13, 441; 19, 394) and others has demonstrated the analogy between compds. of trivalent V and those of trivalent Cr. They form hydrated salts (chlorides, bromides, iodides) and double salts (fluorides, cyanides, alums, oxalates). The hydrated cations and complex anions of V thus formed differ only from those of Cr in being less stable in soln. Cr also with 1 H_2O and an acid radical forms complexes with the urea mol. with NH_3 and with organic bases. In preceding papers (*C. A.* 5, 1279; 7, 3937) the same derivs. for Fe^{III} were described. The present paper is a description of the urea derivs. for Cr^{III}. The vanadyl urea compds. have the general formula $VX_3.6CON_2H_4$ and are perfectly analogous to the similar compds. of Fe^{III} and Cr^{III}. Thus if M = Cr^{III} or V^{III} or Fe^{III} the formulas for the 3 series are: $M(ClO_4)_3.6CON_2H_4$, $MI_3.6CON_2H_4$, $MBr_3.6CON_2H_4.3H_2O$, $X(SO_4)I.6CON_2H_4$. These compds. are similar even in color. The Cr-urea derivs. are green, the Fe-urea derivs. are azure and the V-urea derivs. are blue-green. The periodides are red-brown. The dichromate and permanganate of Cr^{III}-urea could not be obtained since both oxidize Cr^{III} even in the presence of urea. The constitution attributed to these derivs. is the Werner formula $\left[V\ldots\left(OC\begin{matrix}NH_2\\NH_2\end{matrix}\right)\right]X_3$. Five g. V_2O_5 suspended in 40 cc. of 25% H_2SO_4, treated with SO_2 first in the cold then in the warm, gave a blue liquid containing all V as VX_4. From this the SO_2 was eliminated by boiling and the resulting solution reduced electrolytically in a Pt crucible. The crucible served as the cathode and a Pt wire served as anode placed in 20% H_2SO_4 as the anode liquid in a porous vessel. A current d. of 3 amps. per sq. dm. was used and the electrolysis continued until the cathode liquid was green and gave a ppt. with NH_3. Urea was then added until nearly satd. and then 20 g. $NaClO_4$ in concd. aq. soln.; *vanadylurea perchlorate,* $[V(CON_2H_4)_6](ClO_4)_3$, was pptd. as a blue-green cryst. powder, stable in air, little sol. in cold H_2O, more sol. in hot H_2O, but hydrolyzes on standing. A concd. soln. of $VBr_3.6H_2O$ (Piccini and Brizzi, *Z. anorg. Chem.* 13, 442(1897)) treated with urea or the $V_2(SO_4)_3$ soln. obtained above treated with urea and NaBr, pptd. *vanadylurea bromide,* $[V(CON_2H_4)_6]Br_3.3H_2O$, as a blue-green powder, gives a brown soln. in H_2O, but in acid soln. or in H_2O containing urea the soln. is green. The

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$V_2(SO_4)_3$ soln. treated with urea + NaI pptd. *vanadylurea iodide*, $[V(CON_2H_4)_6]I_3$ as blue-green needles, sol. in H_2O with a brown color. The $V_2(SO_4)_3$ soln. treated with NaI + I pptd. *vanadylurea periodide sulfate*, $[V(CON_2H_4)_6]ISO_4.I_2$, red-brown microscopic needles. E. J. WITZEMANN.

New researches on the metallic ureas. G. A. BARBIERI. Univ. Ferrara. *Atti accad. Lincei* 24, I, 916–21(1915).—In 2 earlier notes (cf. *C. A.* 7, 3937 and preceding abstr.) the ferri and vanadyl urea compds. $[Fe(OCN_2H_4)_6]X_3$ and $[V^{III}(OCN_2H_4)_6]X_3$ were considered as derivs. of aquo-salts $[M^{III}(H_2O)_6]X_3$ by the substitution of urea for H_2O. Other elements capable of giving hexahydrate salts like those of Cr, Fe and V^{III} are Al and Ti. 7 aluminio-urea derivs. of the above type were isolated, but the chloride, bromide and nitrate could not be obtained because of their great solubility. The Al-urea salts have a compn. analogous to those of Cr, Fe and V^{III} and are probably isomorphous. At least aluminio-urea perchlorate forms mixed crystals with vanadyl-urea perchlorate. With Ti^{III}, because of the greater solubility and instability of its salts, only one deriv. titani-urea perchlorate, $[Ti^{III}(OCN_2H_4)_6](ClO_4)_3$ was obtained pure. It is strange that the strongly oxidizing ClO_4 group can exist in a Ti_I^{II} deriv. without being reduced and constitutes a new proof that the metallic atom in metal ureas forms a complex with the urea mol. The persulfate of chromi-urea and ferri-urea are also described. Previously (*C. A.* 5, 3771) it was shown that the persulfate hydrates of Mg, Mn, Co and Ni cannot be obtained as solids but are easily obtained as hexamethylenetetramine derivs. This method fails with Cr and Fe^{III} persulfates and so the urea derivs. were obtained. Finely powdered urea was added to a concd. soln. of $Al(ClO_4)_3$ nearly to satn. and *aluminio-urea perchlorate*, $[Al(OCN_2H_4)_6](ClO_4)_3$ seps. as a white powder, non-hygroscopic, little sol. in alc., sol. in H_2O, less sol. in the presence of an excess of urea and $NaClO_4$. Adding urea and $NaClO_4$ to a soln. containing $Al_2(SO_4)_3$ and $V_2(SO_4)_3$ gives a homogeneous pale blue ppt. which is a solid soln. of aluminio- and vanadylurea perchlorates. A concd. soln. of $Al(NO_3)_3$ treated with urea and a very sol. permanganate, like $Mg(MnO_4)_2$ sepd. *aluminio-urea permanganate*, $[Al(OCN_2H_4)_6](MnO_4)_3$, as black crystals, soln. in H_2O violet, forms a solid soln. when pptd. with the preceding perchlorate deriv. *Aluminio-urea dichromate*, $[Al(OCN_2H_4)_6]_2(Cr_2O_7)_3$ is formed with $Na_2Cr_2O_7$ similarly. NaI added in excess to a soln. of urea + $Al(NO_3)_3$ ppts. *aluminio-urea iodide*, $[Al(OCN_2H_4)_6]I_3$ as a white easily sol. cryst. powder. This iodide dissolved in a NaI soln. with I gives *aluminio-urea periodide*, $[Al(OCN_2H_4)_6]I_3.3I_2$, graphite-like crystals, sol. in H_2O and EtOH. $Al_2(SO_4)_3$ + urea + NaI soln. of I seps. *aluminio-urea periodide-sulfate*, $[Al(OCN_2H_4)_6]ISO_4$, as little sol. rose-orange crystals. Using $Al(NO_3)_3$ instead of *aluminio-urea periodide-nitrate*, $[Al(CON_2H_4)_6]I(NO_3)_2.I_2$, seps., rosy cryst. little sol. powder. 5 g. Ti^{III} acid sulfate ($3Ti_2(SO_4)_3.H_2SO_4.25H_2O$: Stahler, *Ber.* 39, 2621(1905)) + 20 g. urea were treated with H_2O drop by drop until the paste became a blue-violet liquid and then the addition of a concd. soln. of 30 g. $NaClO_4$ sepd. *titani-urea perchlorate*, $[Ti^{III}(OCN_2H_4)_6](ClO_4)_3$ as a violet cryst. powder, stable in the air. A soln. of Ti^{III} acid sulfate + urea, treated with NaI ppts. violet crystals, probably *titani-urea iodide*. A concd. soln. of chromi-urea chloride treated with $(NH_4)_2S_2O_8$ ppts. *chromi-urea persulfate*, $[Cr(OCN_2H_4)_6]_2(S_2O_8)_3$, as greenish white crystals. Similarly a concd. soln. of $FeCl_3$ urea gives with $(NH_4)_2S_2O_8$ a bluish green cryst. ppt. of *ferri-urea persulfate*, $[Fe(OCN_2H_4)_6]_2(S_2O_8)_4$, gives a yellow soln. in H_2O. E. J. WITZEMANN.

Thermal analysis of mixtures of alkali hydroxides with the corresponding halides (SCARPA) **2.**

HEDVALL, J. A.: **Ueber die Reaktionen zwischen Kobaltoxydul u. Aluminumoxyd bei höheren Temperaturen.** Berlin: R. Friedlander & Sohn.

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HEDVALL, J. A.: **Ueber die Reaktionen zwischen zinndioxyd und Kobaltoxydul bei höheren Temperaturen.** Berlin: R. Friedlander & Sohn.

HEDVALL, J. A.: **Ueber Kobaltmagnesium-Rot.** Berlin: R. Friedlander & Sohn. 1.20 M.

7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Adjustment of the direct electric lighting current to electroanalysis. E. J. KAUFFMAN. *Met. Chem. Eng.* 13, 524–5(1915).—The d. c. is led through a suitable rheostat in series with 3 resistance boxes of the grid type; then by means of a selective switch suitable shunts are established, the voltage of these shunts being that of the drop in potential between the shunt connections. By manipulating the selective switch and rheostat in conjunction with each other, any voltage from 0.1 v. up to that desired may be reached. A sketch giving details for 4 simultaneous detns. shows that for the 220 v. circuit about 400 ft. of no. 18 nichrome wire are required for the rheostat, and 70 ft. of the same kind of wire for forming the coil from which the potential drops are taken by means of the selective switch. Fiber board is used in construction of rheostat and switch, large, heavy Cu rivets for contact pieces, spring bronze for the contact arms. There are 24 contact pieces on the rheostat and 10 on the selective switch, the leads from the rheostat being equally spaced along the 400 ft. of wire and in series with it. The leads from the 70 ft. coil to the selective switch are best adjusted by having the voltmeter and ammeter in circuit along with a pair of electrodes immersed in acidulated H_2O. The frames or boxes upon which the coils are to be wound are made of "Transite" board. The leads from the resistance coils to the rheostat and selective switch are of well insulated no. 12 Cu wire. The outfit has been used for the detn. of Cu, Sn, Sb (sepn. of Sn and Sb), Bi, Ni, Mn, Fe, Zn and Pb. By using one pair of switch arms at the selective switch for each electrolytic place required, 2 or more unlike detns., may be handled at the same time, *e. g.*, a detn. requiring 5 amp. and 5 v. may be carried out with a simultaneous detn. requiring 2 amp. and 3 v., etc. Each pair of electrodes must have, of course, its own pair of wires corresponding to their respective switch arms. F. W. SMITHER.

Acid potassium phthalate and acid sodium phthalate as standards in acidimetry and alkalimetry. W. S. HENDRIXSON. *J. Am. Chem. Soc.* 37, 2352–9(1915).—A soln. of HCl was standardized by the const. boiling method, by pptn. as AgCl, by titration against C_6H_5COOH, and by the acid K and Na phthalates. All of the methods agreed within 0.1% except the const. boiling method. The salts are easily prepd. and have a high temp. coeff. of soly. so that they are readily purified by crystn. Added advantages are the ready soly. in H_2O and the high mol. wt. E. B. MILLARD.

Standardization of sodium thiosulfate volumetric solution. JOSEPH L. MAYER. *J. Am. Pharm. Assoc.* 4, 690–2(1915); see *C. A.* 9, 1286. M. I. W.

An investigation of the "chromate method" for separating the alkaline earths. HUBERT B. VICKERY. Dalhouse Univ., Halifax, N. S. *Trans. Nova Scotian Inst. Sci.* 14, 30–40(1914–15).—Each pptn. occurring in the chromate process for the sepn. of the alk. earths has been quantitatively investigated. This process has been found not to effect an exact sepn. of the 3 metals. V. suggests an improvement by which the sepn. is practically complete, the procedure being as follows: To the soln. after the removal of the Zn group add NH_4OH, NH_4Cl and $(NH_4)_2CO_3$ at 70°, since above this temp. carbonates react with NH_4Cl to form sol. chlorides, and at lower temps. both Ca and Ba tend to ppt. in a gelatinous mass. The pptn. of the carbonates is

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usually complete at the end of several min. Dissolve the pptd. carbonates from the filter with hot HOAc, add K_2CrO_4 to the filtrate a few drops at a time with const. stirring, and finally boil the mixt. Under these conditions, 500 mg. Ba and Sr give no ppt., while 4 mg. Ba give a distinct test. Evap. the filtrate from the Ba pptn. to 80 cc. and add 80 cc NH_4Cl, after which the addition of 10–15 cc. $(NH_4)_2SO_4$ brings down the Sr as a fine, granular, white ppt. The confirmatory test for Sr with $CaSO_4$ is recommended. Ppt. the Ca with $(NH_4)_2C_2O_4$ from a strongly ammoniacal soln. Under these conditions, 1 mg. Ca can be detected in the presence of 400 mg. of Ba and Ca. H. JERMAIN CREIGHTON.

Two methods of separation of the metals of the alkaline-earth group. ALICE G. PETERSON. *J. Am. Chem. Soc.* 37, 2346–52(1915).—In the first method the soln. contg. the salts of Mg, Ca, Ba, and Sr is treated with an excess of $(NH_4)_2CO_3$ and $(NH_4)_2SO_4$ together, heated 20 min., filtered, the ppt. extracted with 1% HOAc until only $BaSO_4$ remains, and the latter confirmed in the flame. The soln. is made alk. with NH_4OH, then treated with an excess of $(NH_4)_2C_2O_4$ and $(NH_4)_2CO_3$ together, and heated. The ppt. is again extd. with 1.5 vols. of 1% HOAc to dissolve $SrCO_3$, and leave the residue of CaC_2O_4. Mg may appear with the Ca, or it may be dissolved in the second treatment with HOAc. *Second method.* Part of the original soln. is tested for Ba with $K_2Cr_2O_7$. The remainder, without removing Ba, is treated with NH_4Cl and pptn. effected with $(NH_4)_2SO_4$, and the mixt. boiled. Most of the Ca remains in soln., and Ba and Sr are pptd. Sepn. of $SrSO_4$ and $BaSO_4$ is effected by treatment with an excess of $Pb(C_2H_3O_2)_2$, by which $SrSO_4$ is changed into $Sr(OAc)_2$ while $BaSO_4$ is unchanged. The excess Pb is removed with H_2S and Sr tested for with $(NH_4)_2CO_3$ as in method 1. The first method has been used successfully with beginning students. E. B. MILLARD.

The removal of platinum from the product of ore decomposition for the volumetric determination of iron. L. BRANDT. *Chem. Ztg.* 39, 553–5(1915).—About 5 g. ore are evapd. with concd. HCl, treated with dil. HCl, filtered into a graduated flask, the residue washed, ignited and decompd. by one of the usual methods. To the hot HCl soln. of the residue is added $SnCl_2$ until the Fe is reduced and the red-brown Pt color appears, then 1–2 cc. $SnCl_2$ in excess and 1 cc. 0.1 *N* As_2O_3 soln. After swirling and heating a little a black ppt. appears. The soln. is then boiled, settled a little, filtered into the graduated flask, the ppt. washed with hot dil. HCl and hot H_2O, the flask filled to the mark and an aliquot part titrated by the dichromate-diphenylcarbazide method. If the ore contains over 0.4% As the main soln. is oxidized by adding chlorate to the flask before adding the residue soln. For the $KMnO_4$ method the oxidation may be omitted with ores of very small As content after pptg. the added As with $SnCl_2$. By the dichromate-diphenylcarbazide method ores with 0.75% As (*C. A.* 8, 1071) may be titrated without oxidation. To remove As, after the Pt is pptd. add at least enough $SnCl_2$ to reduce 0.4 g. Fe, then 15–20 cc. concd. HCl and warm. In a short time a dark brown ppt. will appear, in the clear soln. above the Pt ppt., which soon settles. Filter, as above, into the flask containing the main soln., and wash ppt. If the soln. is too dil. for the As to ppt. add more concd. HCl, but in titrating the amt. of HCl should be approx. constant. A table of results shows variations of from —0.04 to +0.07% Fe in the presence of various salts. B. gives another method of removing Pt by means of Mg powder or ribbon, but the results are less satisfactory. See *C. A.* 8, 1071; 9, 899. J. H. MOORE.

A method for the volumetric estimation of lead. F. D. MILES. *J. Chem. Soc.* 107, 988–1004(1915).—A review of previous methods is given. M.'s method is based on the fact that H_2S decomposes $PbSO_4$. $PbSO_4$ produced by rapid evapn. with H_2SO_4 is more difficult to decompose than that obtained by the addition of H_2SO_4 to a soln.

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of a Pb salt. Evap. the soln. containing the Pb to fumes with H_2SO_4, preferably in a conical flask. Add 50 cc. of H_2O, cool, filter, wash with 5% H_2SO_4, and finally wash 4 times with a mixt. of equal vols. of EtOH and H_2O. Transfer paper and ppt. to a conical flask, and add 10 cc. of a satd. aqueous soln. of H_2S for each 0.1 g. of Pb. Warm the upper part of the flask and tightly insert a rubber stopper. Shake vigorously and heat to the highest temp. that the hand can conveniently bear. Heat for 20 min. at 50° with occasional shaking. Cool, remove stopper and wash. A marked odor of H_2S should be noticeable at this point. In no case should flask and contents stand overnight. Filter through filter paper pulp and wash with distd. H_2O. Boil the filtrate for 2 min. to remove H_2S, cool and titrate with 0.2 or 0.1 *N* NaOH, using methyl red as indicator. Two modifications are sometimes advizable, one being to filter off the $PbSO_4$ on a Gooch crucible, and the other (when Ca is present) to omit the washing with the EtOH-H_2O mixt. and to neutralize any residual acid with NaOH before adding the H_2S soln. The NaOH soln. should be standardized against pure Pb, using the method adopted for analysis. The method is rapid and accurate. Since Pb cannot be sepd. from Sn and Sb by pptn. as $PbSO_4$ the method is not applicable for such mixts. In the presence of an equal wt. of Ca the method was found to be accurate for Pb. In the presence of Ba a modification is necessary. The preliminary evapn. is continued until no more liquid H_2SO_4 remains in the flask. Add 10 cc. of H_2O and 10 cc. of 30% NaOH soln. Heat near the b. p. with occasional shaking for 5 min. and add 50 cc. 20% H_2SO_4. Collect $PbSO_4$ and proceed as usual. This modification gives accurate results when the Ba present does not exceed 25% of the Pb. With larger amounts of Ba no method could be devized to yield complete decomposition of the $PbSO_4$ by H_2S, since the former is enclosed by $BaSO_4$. The presence of Cu caused no sensible error. In the presence of Fe, proceed as follows: After the acid remaining from the first evapn. has been dild. and cooled, filter, and wash with 5% H_2SO_4, keeping as much as possible of the ppt. in the flask. Add a mixt. of 15 cc. concd. HCl and 10 cc. H_2O, and heat. Add 5 cc. concd. H_2SO_4, evap. and proceed by the usual method. The presence of Bi caused errors from 0.8 to 1.5%. Results of analysis of various Pb ores are given, the agreement between the proposed method and the gravimetric method being remarkably close. E. W. Boughton.

The volumetric estimation of ferrocyanides. Bertram Campbell. *Analyst* 40, 327–8(1915).—Introduce 1.5–2.0 g. of finely powdered ferrocyanide into a 500 cc. conical flask by means of a funnel. Use the smallest quantity of water to rinse the funnel, and then add 30 cc. H_2SO_4 (5 vol. concd. H_2SO_4 and 1 vol. water). Heat over a small flame until the $Fe(CN)_6$ complex is broken down and the soln. becomes quiescent. After cooling and dilg., add 5 g. Zn. When the whole of the Zn is dissolved and the Fe is completely reduced, titrate the soln. with $KMnO_4$. 1 cc. 0.1 *N* $KMnO_4$ = 0.0422 g. $K_4Fe(CN)_6.3H_2O$, or 0.0484 g. $Na_4Fe(CN)_6.10H_2O$. A correction should be made, for Fe present in the Zn. The method is of course inapplicable to products containing salts of Fe other than the ferrocyanide. P. B. Dunbar.

Detection of manganese. F. Bardach. *Chem. Ztg.* 39, 457–8(1915).—Polemical against Sacher (cf. *C. A.* 9, 2043). F. W. Smither.

Detection of manganese. J. F. Sacher. *Chem. Ztg.* 39, 458(1915).—A reply to the preceding. F. W. Smither.

Nephelometric estimation of phosphorus. P. A. Kober and G. Egerer. *J. Am. Chem. Soc.* 37, 2373–81(1915).—The reagent of Pouget and Chouchak (*C. A.* 3, 1258; 5, 3208), a HNO_3 soln. of strychnine and molybdic acid, was used. This reagent produces a very sensitive reaction with phosphates (1 mg. of P in 2000 cc. of soln. gives a very marked suspension of insol. substance) similar in sensitiveness to Nessler's reagent or Graves' reaction for NH_3 (*C. A.* 9, 1587). Details are given which allow

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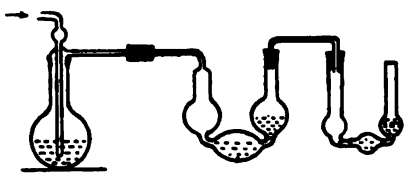
the detn. of 0.005 mg. of P in 10 cc., or one part in 2 million with the nephelometer. E. B. MILLARD.

The factor to be used for the calculation of phosphoric acid in Neumann's method. The factor as influenced by the water used for washing the yellow precipitate. S. L. JODIDI AND E. H. KELLOGG. *J. Franklin Inst.* 180, 349–67(1915).—J. and K. conclude from exptl. data reported that: (1) The factor used for the calcn. of P_2O_5 in Neumann's method is to a certain degree influenced by the amt. of H_2O used for washing the yellow ppt. The larger the amt. of wash H_2O, the higher is the factor within certain limits, and *vice versa*. (2) When the yellow ppt. was washed 4 times with 150 cc. of ice-cold H_2O, the losses of P in filtrate and washings ranged from 1.07 to 3.95% of the P employed. By washing the ppt. 3 times with but 50 cc. of H_2O the losses ranged from 0.89 to 3.2%. (3) The more substance (P) employed in Neumann's method, the smaller is the percentage of P lost in filtrate and washings and *vice versa*. (4) The yellow ppt. is not absolutely insol. in the liquid from which it is pptd., the losses of P ranging from 0.4 to 0.77% of the P employed. (5) Instead of washing the yellow ppt. with 150 cc. portions of ice-cold H_2O 3 or 4 times, as is recommended by Neumann, it suffices to wash it 3 times with 50 cc. portions of H_2O. A 300 cc. round-bottom flask is more convenient than one of 500 to 750 cc.; the latter is, however, to be used for oxidation of org. matter, if present. F. W. SMITHER.

Sampling of churn-drill prospect holes. F. G. MOSES. *Eng. Mining J.* 100, 301–4(1915).—Bailing difficulties with dart valve bailers, and hand and automatic sampling with the Jones sampler for chemical and geological samples are discussed. L. P. WEBBERT.

New method of estimating bromine and chlorine in organic compounds. PHILIP W. ROBERTSON. So. Kensington. *J. Chem. Soc.* 107, 902–7(1915).—The substance (enough to give halogen equiv. to about 9 cc. 0.1 *N* $AgNO_3$) is heated in the app. shown in the diagram with 4–6 g. CrO_3 and 25–30 cc. H_2SO_4 and the volatile products passed by means of a stream of air into 10 cc. of 10% aq. NaOH and 10 cc. of 3% H_2O_2. The 2nd U-tube contains a little NaOH. Heating is continued, with occasional shaking, for 45–60 min. The alk. H_2O_2 soln. converts any Br formed into NaBr, while in the case of Cl compds. the volatile Cl and CrO_2Cl_2 form NaCl and Na_2CrO_4. The latter must be reduced before titrating according to Volhard; this is done by heating to boiling and neutralizing with HNO_3. The $AgNO_3$ and KSCN solns. must be standardized under the same conditions as in the analysis. The results tended to be a little low, but were in good agreement with the theory except in the case of several brominated aromatic hydrocarbons, in which case sublimation of the substance occurred. These compds. gave good results when a quartz tube containing Pt-asbestos was inserted between the flask and the absorption tube and the portion subliming over burned in a stream of O. M. HEIDELBERGER.



Rapid manipulation of Kjeldahl's method (HOUGH) 29. Determination of iodine in presence of organic matter (KRAUSS) 11B. The reaction between ferrous sulfate and potassium dichromate (NEIDLE) 2. Practical alcoholometry (BARENDRECHT) 1.

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8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

Sulfur from Zonda, Argentine. C. PERRIER. Univ. Turin. *Atti accad. Lincei* 24, I, 622–5(1915).—A crystallographic description. E. J. WITZEMANN.

The mineralogy of Sardinia. Some interesting crystals of argentite and of quartz. E. GRILL. *Atti accad. Lincei* 24, I, 855–8(1915). **Some interesting crystals of barite.** *Idem* 24, I, 961–5(1915).—Crystallographic descriptions. E. J. WITZEMANN.

Some minerals of the tufa of Isernia, Campobasso. E. QUERCIGH. Univ. Turin. *Atti accad. Lincei* 24, I, 778–83(1915).—Some specimens of tufa from around Isernia collected by F. Zambonini were studied, and sanidine, magnetite, olivine, black and green augite, biotite, and amphibole observed. The crystallographic measurements of the first differ from those of specimens from other localities. The rarest mineral is black amphibole. Measurements of all the minerals are given. E. J. W.

Optical properties of colloidal silicic acids. F. RINNE. Leipzig. *Neues Jahrb. Min. Geol.* 39 (Beil. Bd., Bauer Festschrift), 388–414(1914).—By means of an elaborate goniometer-refractometer, with heating and cooling chambers, which is described in detail, the *ns.* of various SiO_2 products and volcanic glasses were detd. between —160 and 1000°. The *ns.* increased in general regularly with the temp., but that of precious opal from Hungary showed a max. at about 0°, and decrease from that point to 58°, where loss of H_2O interrupted the observations. The point of max. *n* of H_2O in opal does not coincide with that of max. d. (4°); this fact is evidently connected with the colloidal nature of the material. A discussion of the nature of "baueritization," or the removal of bases from mica by acids without complete destruction of the molecular condition, so that the resulting $SiO_2.H_2O$ retains micaceous properties, is also given. The loose molecular structure of this form of SiO_2 apparently permits its particles to vibrate strongly at ordinary temps. E. T. W.

Discoveries of minerals in Styria and Lower Austria. A. SIGMUND. *Mitt. natur. Ver. Steiermark* 50, 324–48; *Neues Jahrb. Min. Geol.* 1915, I, Ref. 88–90.—The minerals of the heavy metals are chalcopyrite, malachite, limonite and magnetite; hornblende, epidote and amphiboles are among the silicates. Quartz, calcite, dolomite and magnesite are found in large quantities. The compns. of several samples of magnesite are given. H. W. DAUDT.

The mineralogy of the Alexeévskii mine in the Minusinsk district. P. PHILIPENKO. *Mater. Kennin. Geol. Bau. Russ. Reich.* (*Vernadskii-Festschrift*) 1914, Ref. 176–200; *Neues Jahrb. Min. Geol.* 1915, I, Ref. 190–2.—P. gives the names and some of the properties of the 24 minerals present. Besides calcite, quartz, and various silicates, ores of Fe, Cu and Mo, including limonite, magnetite, chalcopyrite, malachite, molybdenite and

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molybdite are found. The last named consists of MoO_3 58.0, Fe_2O_3 17.4, H_2O 18.8, insol. 5.4%; these figures correspond to the formula, $7MoO_3.2Fe_2O_3.19H_2O$.
H. W. DAUDT.

The opening up and the contents of a crystal cavity in the granite at Wildenau, Saxon Vogtland. BRUNO DOSS. Riga. *Neues Jahrb. Min. Geol.* 39 (Beil. Bd., Bauer Festschrift), 126–85(1914).—A detailed mineralogic description of large crystals and groups of feldspar and quartz from a cavity in a pegmatite lens in this granite is given. Two analyses of feldspar show the compn. to be normal, with K exceeding Na. Secondary feldspar and talc-like muscovite occurring as coatings are also described, together with the following minerals which are found in smaller cavities: molybdenite, clinochlore, diopside, apatite, pyrite, stibnite, Bi, hematite, calcite, and wad. The deposit was evidently formed by pneumatolytic and hydatopneumatolytic processes, and the presence of smoky quartz, which is decolorized at 300–350°, shows that the temp. was fairly low. The secondary minerals formed by lateral secretion. E. T. W.

The chemical composition of bornite. AUSTIN F. ROGERS. Stanford Univ., Cal. *Science* 42, 386–8(1915).—Previous work on the compn. of bornite is reviewed. The 59 recorded analyses show a Cu content varying from 77 to 55% and an Fe content varying from 18 to 6%. These are plotted in a triangular coördinate diagram, and most of them found to fall near a line corresponding to Kraus and Goldsberry's series $Cu_xFe_2S_{(x/2)+2}$ (*C. A.* 8, 2543). Some lie above the line (toward the Fe corner of the triangle) which is explained as probably due to error or the presence of oxidation products. The only clustering of analysis points in the diagram is around Cu_5FeS_4. This is, however, not necessarily the formula of bornite, as it may represent an "average solubility" of one component of a solid soln. in another. The lower limit is Cu_3FeS_3. Mechanical admixture will explain part but not all of the variability. Isomorphous mixture and morphotropic series relations (K. and G.) seem improbable. It is therefore suggested that bornite is a solid soln. of Cu_2S in Cu_3FeS_3, which will explain many observed facts. Many of K. and G.'s minerals are doubtless solid solns. and mechanical mixtures; a revision of the opaque sulfo-salt minerals seems necessary. E. T. W.

Opal and the accompanying minerals of the Elisavetgrad district. P. GRISHCHINSKII. *Mem. Soc. Natur. Kiev* 23, 113–25; *Neues Jahrb. Min. Geol.* 1915, I, Ref. 168.—The opals are found in 2–3 cm. thick veins in the granite of the Verbovaja gorge near the village of Novo-Michailovka. Tables of chem. compn. are given. A specimen of the milky white variety contained 0.41% Fe_2O_3, while one of the red showed 2.32%. Surrounding the opals is chalcedony containing particles of quartz, formed as a result of dehydration. A table of photomicrographs is given. H. W. DAUDT.

Double salts of calcium magnesium carbonate. K. SCHMIDT. *Dissertation Jena* 1913, 49; *Neues Jahrb. Min. Geol.* 1915, I, Ref. 169–70.—By mixing solns. of NH_4 sesquicarbonate, $MgCl_2$ (or $MgSO_4$) and $CaCl_2$ in definite proportions, spherolites of Ca Mg carbonate are formed. The order of addition has no effect on the chem. constitution, but does change the mineralogical character. Standing in the mother liquor, increase of temp., addition of more $MgCl_2$ soln. as well of NH_4 sesquicarbonate cause an increase of the Mg content of the ppt. On long standing in the mother liquor the spherolites become cloudy and needle-like crystals of $MgCO_3.3H_2O$ sep. out. The Ca content is increased by the addition of more $CaCl_2$ soln. The max. Ca content which can be obtained in the clear spherolites is 97.04 $CaCO_3$ and the minimum 61.16%. There is also a definite max. in the increase of the Mg content. The change caused by *N* $MgSO_4$ is the same as that caused by 2*N* $MgCl_2$. S. claims that the expts. can be duplicated with but slight differences, particularly at lower temps. H. W. DAUDT.

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Corda's "spherosiderite" from the coal basin at Radnitz-Braz, Bohemia. BRUNO KUBART. Graz. *Sitzb. Akad. Wiss. Wien* 110, 1035–48(1911); *Z. Kryst. Min.* 54, 398–9(1914).—This botanical article contains the following chem. data: A "spherosiderite" from Radnitz-Braz proved to be a siliceous concretion with the compn.: SiO_2 88.48, Fe_2O_3 0.55, Al_2O_3 4.10, CaO 0.38, H_2O 0.82, loss on ign. (CO_2 + organic matter) 5.67%. Similar nodules from the Ostrau coal were found to be dolomitic: SiO_2 0.18, Al_2O_3 3.54, Al_2O_3 + Fe_2O_3 (insol.) 3.60, FeO (sol.) 6.46, CaO 32.92, MgO 12.71, H_2O 0.53, P_2O_5 0.19, Cl trace, CO_2 31.62, C 8.11%. E. T. W.

Aurichalcite from the Tsuzuragahayama mine, Province of Nagato, Japan. T. KATO. *J. Geol. Soc. Tokio* 20, 9–11(1913); *Neues Jahrb. Min. Geol.* 1915, I, Ref. 171–2.—The mineral is found in an old Ag mine, recently reopened, in cavities in masses of smithsonite, occasionally on an older layer of malachite. Analysis showed CO_2 12.55, H_2O 9.44, ZnO 58.12, CuO 17.94, Fe_2O_3 1.46, MgO and SO_3 traces, Al_2O_3, CaO none. Other ores found in the same mine are zinc blende, pyrite, arsenopyrite, chalcopyrite and galena. H. W. DAUDT.

Occurrence of amazon stone at North White Plains, N. Y. F. F. BURR. *School Mines Quart.* 36, 186–8(1915).—The mineral occurs in pegmatitic masses of limited extent in the Yonkers gneiss; it is in good crystals up to 7 and 8 inches in diam. and is greenish in color, though the basal cleavage shows a pink center. As a rule the crystals are a mixt. of albite and microcline. A. WANDTKE.

Investigations on cordierite. L. OPPENHEIMER. *Dissertation Heidelberg* 1914; *Verh. Heidelberg naturh.-med. Ver.* 13, 257–302; *Neues Jahrb. Min. Geol.* 1915, I, Ref. 175–80.—Mainly a petrographic study. The chem. compns. of 7 varieties are given. The av. compn. is SiO_2 49.59%, Al_2O_3 32.62, FeO 4.66, Fe_2O_3 0.88, CaO trace, MgO 10.49, K_2O 0.14, Na_2O 0.30, H_2O 1.77, Na_2O and K_2O traces, Li_2O never in larger quantities. The following formulas are calcd. from the results: (I) $10SiO_2.4Al_2O_3.4MgO.H_2O$. (II) $15SiO_2.6Al_2O_3.6MgO.2H_2O$. (III) $8SiO_2.3Al_2O_3.3MgO.H_2O$. O. prefers the first on account of its simplicity. H. W. DAUDT.

Secondary leonhardite and stilbite from the Sololkaskfa Mountains in Tiflis. N. SURGONOV. *Mater. Kenntn. Geol. Bau. Russ. Reich* (*Vernadskii-Festschrift*) 1914, 190–2; *Neues Jahrb. Min. Geol.* 1915, I, Ref. 184–5.—The minerals occur with quartz in veins of calcite. Crystallographic data and tables of analyses of both are given. H. W. DAUDT.

Mineralogical study of lepidolite from Elba. PROBO COMUCCI. R. Ist. stud. sup. Florence. *Atti accad. Lincei* 24, I, 1068–73(1915).—The specimen gave on analysis: SiO_2 48.05, Al_2O_3 28.18, Fe_2O_3 2.51, TiO_2 0.16, MnO 2.13, K_2O 7.77, Li_2O 5.27, F 6.32, H_2O 1.65%. Ti has never before been reported as occurring in this mineral. The Fe content is unusually large. The formula $7SiO_2.3Al_2O_3.K_2O.2Li_2O.4F.H_2O$ corresponds closely with this analysis. The sp. gr. = 2.842 and by Becke's method n_D = 1.550. Other mineralogical data are given. E. J. WITZEMANN.

The origin of talc (steatite)-deposits. C. DOELTER. Vienna. *Neues Jahrb. Min. Geol.* 39 (Beil. Bd., Bauer Festschrift), 521–30(1914).—Deposits of talc are divided into 4 classes: (1) in connection with quartz and quartz-bearing rocks: (2) in connection with chloritic and amphibole or pyroxene-schists; (3) in or near serpentine; and (4) occurring with magnesite and dolomite. Examples of each are described, together with synthetic expts. corresponding to them, analyses and other chem. data being given. E. T. W.

Deposit of euxenite in Brazil. ALBERTO BETIM. *Compt. rend.* 161, 177–80(1915).—This deposit was found near Pomba, State of Minas-Geraes, in a gneissic region, along with massive syenite, with both gneissic and pegmatitic structures. Chem.

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characters detd. by the Féry spectrograph showed that the feldspar contained nearly equal amts. of Na and K, also small quantities of Ba and Ca. Crystals of albite were found which contained Ba. From an examn. of thin layers it is probable that the albite, forming a second phase, has transformed orthoclase to anorthoclase and microline to microperthite. The elements of the first crystn. of the syenite are microscopic grains of titanite and amphibole. Chemically it is characterized by richness in Mg and Fe and by the presence of Mn and Na; Al_2O_3 is found only in traces. The syenite appears to be of a Na-Mn-hornblende type, in which Al_2O_3 has been replaced by Fe_2O_3. The presence of P and Ca shown in certain of the spectrographic observations on the syenite, suggests the presence of apatite. The euxenite consists of a vitreous core with conchoidal fracture, black to red in color and covered with an earthy crust of a greenish, greasy appearance. Sp. gr. of the core 4.88. Ti is the predominating element followed by Cb; Yt, Yb, and Er are present. Quant. chem. analysis gives 4 to 11% of U_3O_8, some Th and traces of Ce. The spectrograph shows the presence of As, Sn, Pb, Ga, and Au. The radioactivity of the euxenite varies between 0.35 and 0.51. Associated with the euxenite are fine crystals of xenotime with clear gray color, brown on cleavage surfaces. L. W. RIGGS.

The presence of monazite in the sand and in the gravel of southern Somalia. ETTORE ARTINI. *Atti accad. Lincei* **24**, I, 555–8(1915).—Monazite has been found by A. in the alluvium of Guiba, in the ancient gravels of the interior (Lugh), in the sand of the Arabian desert (*Atti soc. ital. sci. nat.* **53**, 372(1914)) and in the Nubian sandstone. The same mineral has now been found in the sand of Guiba. 500 g. of this sand gave on proper treatment 0.3 g. of yellow granules, mostly monazite. Besides large amts. of Fe_2O_3 (80%) and TiO_2 (16.9%) the sand contains variable, small amts. of quartz, augite, garnet (almandine), zircon, epidote, green spinel, orthoclase and microcline, rhombic pyroxene, green hornblende, cyanite, tourmaline, staurolite, titanite, apatite and the monazite. E. J. WITZEMANN.

Notes on the occurrence of anhydrite in the U. S. AUSTIN F. ROGERS. *School Mines Quart.* **36**, 123–42(1915).—R. gives the occurrence by states and localities, and examples of the following modes of occurrence: sedimentary; vein filling; metamorphic product; cavity filling, *a*, in igneous rocks, *b*. in sedimentary rocks; replacement of limestone; and as a dehydration product from gypsum. He states that the common occurrence of anhydrite is in sedimentary beds which on the surface have changed to gypsum. A. WANDTKE.

Metavoltine among the sublimation products of the Pozzuoli solfatara. E. AGUILAR. Naples. *Boll. soc. nat. Napoli* **25**, 28–30(1911); *Z. Kryst. Min.* **54**, 389(1914).—Golden yellow plates occurring in cavities on the eastern wall of the solfatara together with alum, ceramohalite and coquimbite are shown by A. to belong to this species. E. T. W.

The fractional precipitation of some ore-forming compounds at moderate temperatures. ROGER C. WELLS. U. S. Geol. Survey, *Bull.* 609, 46 pp.(1915).—The expts. described were made to aid in elucidating the chemistry of ore deposition. They yield as their immediate result the order of soly. of the compds. of each of the classes investigated—sulfides. hydroxides, carbonates, and silicates. The results with the silicates are really those due to hydroxides, since the silicates are completely hydrolyzed in aq. soln., but they show for one thing that metallic bases are incapable of removing SiO_2 completely from soln. The work of Anthon and Schürmann, which covered the sulfides, is discussed to compare their results with the solubilities and soly. products detd. by physico-chem. methods. The order of soly. of sulfides obtained from expts. on fractional pptn. agrees better with soly. products calculated from e. m. f. measurements than it does with Weigel's results obtained by cond. detns. Incidentally, it is

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shown that the immediate ppt. produced by alk. sulfides and Cu salts contains a much higher proportion of Cu_2S than that formed by H_2S in acid solns. The pptn. series obtained for the hydroxides, beginning with the most insol., is as follows: Fe‴, Al, Cu″, Zn, Pb, Ni, Ag, Fe″, Mn″, Mg, Ca. The series obtained for carbonates, based on results with $NaHCO_3$ as precipitant, is: Hg, Pb, Cd, Mn, As, Fe″, Zn, Ca, Mg. R. C. WELLS.

Petrology and economic geology of the Skykomish Basin, Wash. W. S. SMITH. *School Mines Quart.* 36, 154–85(1915).—The first part of the paper gives the geology of the region, treating briefly the kinds of rocks, periods of batholithic intrusion and mountain building, and the mineralization. The second part deals with the economic geol. According to S. the paragenesis is (1) sericite; (2) quartz, arsenopyrite, and pyrite; (3) chalcopyrite and sphalerite; (4) galena and stibnite; (5) calcite. No free milling ore is found, but the Au is held by the sulfides. There is evidence that the mineralization is due to ascending thermal solns. The deposit falls in Lindgren's class of those formed by "ascending solns. carrying emanations from an igneous magma." The third part deals briefly with the mining properties. A. WANDTKE.

Iron-ore deposits near Nome and placer mining in Seward Peninsula, Alaska. H. M. EAKIN. U. S. Geol. Survey, *Bull.* 622-I, 361–72(1915).—A deposit of ore estimated to contain some hundred thousand tons of 55% Fe and 1.37% MnO is described. The ore is residual limonite carrying P 0.057 and S trace. R. C. WELLS.

The tin ore deposits of Tasmania. FRITZ NOELTING. Hobart, Tasmania. *Neues Jahrb. Min. Geol.* 39 (Beil. Bd., Bauer Festschrift), 346–87(1914).—A detailed geologic, petrographic, and mineralogic description of the Sn ores and the associated granitic rocks. The Sn is in the form of cryst. SnO_2 in pneumatolytic veins and in extensive placer deposits, derived by weathering of the enclosing rocks. E. T. W.

Some cinnabar deposits in Western Nevada. ADOLPH KNOPF. U. S. Geol. Survey, *Bull.* 620-D, 59–68(1915).—Alunite is noted as an associate of cinnabar in the deposits described in this paper, a new association. On the other hand pyrite, marcasite and stibnite have not been observed. The gang in one of the deposits consists of a nearly pure hydrated SiO_2, *viz.*, SiO_2 90.46, H_2O 5.38%; it is accordingly a pulverulent variety of opal. R. C. WELLS.

Studies on the structure of the pyrite-barite deposit at Meggen as the basis for its geological interpretation. ALFRED BERGEAT. Königsberg. *Neues Jahrb. Min. Geol.* 39 (Beil. Bd., Bauer Festschrift), 1–63(1914).—An elaborate investigation of the geological relations and the structure of this deposit lead to the conclusion that both barite and pyrite, as well as the associated sphalerite and other minerals, must have crystd. out on the bottom of the sea in which the enclosing sediments were deposited during the Devonian epoch. Solns. of the substances concerned, especially of Fe, Zn, Pb, Ba, Sr, and S, must have been poured out on this sea bottom, where $CaCO_3$ mud acted as pptg. agent; they were perhaps derived from the magmas which elsewhere appeared as extrusive lava during this epoch. E. T. W.

Geology of titanium and apatite deposits of Virginia. T. L. WATSON AND S. TABER. Va. Geol. Survey, *Bull.* 3A; *Met. Chem. Eng.* 13, 573(1915).—This paper gives the results of field and lab. work in Va. on the extensive rutile deposits of the Amherst–Nelson counties region. Maps, photographs, photomicrographs and analyses, in addition to the text, explain the rock formations and give chem. compn. "The region is shown to be a magmatic area of unusual scientific interest, many of the rock types of which are new and described in detail for the first time." The rutile deposits of Charlotte and Buckingham counties are described; also the ilmenite-apatite occurrence in Roanoke, Goochland and Hanover counties. L. W. RIGGS.

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Monazite, thorium and mesothorium. KARL L. KITHIL. Bur. Mines, *Tech. Paper* 110, 30 pp.(1915).—The world consumption of monazite is now 3000 tons. It is mostly obtained from Brazil, though found in N. Car., S. Car., Idaho, and Col.; the reduction of price, consequent on glutting the market in 1910, rendered its production in this country unprofitable. The monazite consumed contains 1000 tons of Ce, and 1200 tons of mixed La, Nd, and Pr oxides, together with U, Ra, and mesothorium. The extn. of this last as a by-product may make the manuf. of $Th(NO_3)_4$ from monazite profitable in this country. The presence of monazite in gravels can be ascertained by the use of the pocket spectroscope. The history of monazite production, methods of extn. and sepn. and an estimate of the amt. of known deposits are given.
W. B. JOHNSON.

General summary of the transformation processes of the potash salt deposits. M. RÓZSA. Budapest. *Z. anorg. allgem. Chem.* 92, 297–300(1915); cf. *C. A.* 8, 2992; 9, 281, 2045.—The various processes are classified as follows: (I) transformation processes without intermediate phase, subdivided into (*a*) hydro-, (*b*) hydrothermal-, and (*c*) thermal metamorphosis; (II) transformation processes with one intermediate phase, subdivided as combinations of two of the above; and (III) processes with two intermediate phases, a combination of I *a*, *b*, and *c*. Some cases are discussed.
GEORGE W. MOREY.

The Healdton oil field, Carter County, Oklahoma. C. H. WEGEMANN AND K. C. HEALD. U. S. Geol. Survey, *Bull.* 621-B, 1–30(1915).—In referring the source of the oil to the Pennsylvanian beds W. and H. say: "The shales of the Carboniferous were probably not so highly impregnated with org. material capable of producing oil as the typical oil shales, yet their mass is so great that even with a comparatively low % of org. material they might be capable, under proper conditions of temp. and pressure, of generating vast stores of petroleum. Such conditions may well have been supplied by the earth movements that produced the folds in which the oil accumulated, the org. material in the shale undergoing slow distn. under conditions of high pressure and of the temp. induced by the pressure. The product of such distn. may have been petroleum, or it may have been gas, from which on condensation petroleum was formed. Gas passes through rock pores with little friction as compared with oil, and many accumulations of petroleum which are accounted for with difficulty on the supposition that petroleum as such migrated for considerable distances through the rock strata are easily explained by supposing that the petroleum reached its place of accumulation in the form of gas, which later condensed."
R. C. WELLS.

Use of the slide rule in the computation of rock analyses. JAMES H. HANCE. *J. Geology* 23, 560–9(1915).—Certain phases of petrographic and metamorphic-rock work require the conversion of rock analyses into corresponding approx. mineralogical compns. H. submits two tables of mineral % compns. with directions applicable to any ordinary slide rule which accomplishes these conversions with a saving of 50–90% of the time ordinarily required.
W. F. HUNT.

Present condition of the volcanoes of southern Italy. H. S. WASHINGTON AND A. L. DAY. *Bull. Geol. Soc. Am.* 26, 375–88(1915).—The studies of Day and Shepherd at Kilauea have demonstrated the presence of H_2O in the unaltered lava gases, and of Cl and F in only small amounts. Observations have now been extended to other volcanoes. This preliminary paper places on record the state of activity of Vesuvius, Etna, Vulcano, and Stromboli during June, July, and August (1914). The volcanoes at present are largely in a solfataric condition. Steam charged with SO_2, HCl, and H_2S was frequently noted.
W. F. HUNT.

The principle of saturation in petrography: A reply. S. J. SHAND. Stellenbosch, S. Africa. *Geol. Mag.* 2, 339–40(1915).—A further reply to Scott (cf. *C. A.* 8, 889;

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9, 2049). Shand claims that Scott's objections to a classification according to the principle of satn. are not based on facts, but are due to a set of assumptions and possibilities. R. C. WELLS.

Petrology of northwestern Angola. ARTHUR HOLMES. *Geol. Mag.* 2, 228–31, 267–72, 322–28, 366–71(1915).—Petrographic descriptions with analyses of 5 rocks: nepheline-syenite, nepheline-monchiquite, olivine-ulrichite, gray nepheline-phonolite and brown nepheline-phonolite. R. C. WELLS.

The bekinkinite of Barshaw (Renfrewshire), and the associated rocks. G. W. TYRRELL. Glasgow. *Geol. Mag.* 2, 304–11, 361–6(1915).—The rock described, bekinkinite, formerly known only in Madagascar, is part of an extensive sill now considerably decomposed and is composed of the following minerals: titanaugite, barkevikite, aegirine, ilmenite, olivine, apatite, nepheline, analcite, plagioclase, orthoclase and various decompn. products. The individual minerals are described, analyses given and the modes calcd. R. C. WELLS.

Theory of gneiss and of crystalline schists in general. STANISLAS MEUNIER. *Proc. Acad. Nat. Sci. Philadelphia* 1915, 351–62.—According to M. it is incorrect to consider cryst. schists the product of igneous fusion. He states as his opinion that vulcanism and metamorphism both result from the joint action of two equally indispensable factors: on the one hand the subterranean penetration of water and similar matter, circulating in regions of sufficiently high temp., and on the other hand the reduction of impregnated rocks to fragments of all sizes by means of mechanical reactions produced in the crust by the spontaneous contraction of the fluid nucleus underneath. The theories of other investigators are discussed at length. J. H. BOWER.

Some rocks from Terra del Fuoco. II. Crystalline schists. FEDERICO MILLOSEVICH. R. Ist. stud. sup. Florence. *Atti accad. Lincei* 24, I, 398–404(1915); cf. *C. A.* 9, 2049.—A mineralogical description of cornubianitic gneiss, hornfelsite, filladic porphyroid gneiss, chloritic-epidotic gneiss, mica-schist, chloritic-schist, "fillades," quartzite, amphibolic schist and amphibolite from this locality. E. J. W.

A case of sodium-increase during contact-metamorphism. V. M. GOLDSCHMIDT. Kristiania. *Neues Jahrb. Min. Geol.* 39 (Beil. Bd., Bauer Festschrift), 193–224(1914).—Occurrences of the Downton sandstone in the Kristiania region have been studied petrographically and chemically. The unaltered rock consists on the average of 60–70% quartz, 20–30 clay and 10 $CaCO_3$. Analyses of 2 specimens of metamorphosed sandstone, which are recalcd. into tables of mineral comp., show the addition of considerable amts. of Na and other elements. The magma producing the metamorphism was high in Na. E. T. W.

The composition of brachiopod shells. F. W. CLARKE AND W. C. WHEELER. U. S. Geol. Survey. *Proc. Nat. Acad.* 1, 262–6(1915).—Analyses have been made of 5 species of calcareous and 4 of phosphatic brachiopods; the results are tabulated, together with the proximate compns. obtained by deducting organic matter (detd. indirectly), recalg. to 100%, and assigning the constituents to the compds. most probably represented. In the calcareous group, $CaCO_3$ varies from 88.59 to 98.61%, $MgCO_3$ from 0.49 to 8.63, and other constituents within small limits. Previous analyses, 6 of which are similarly recalcd., agree in a broad general way. In the phosphatic group $Ca_3P_2O_8$ varies from 74.73 to 91.74, while $CaSO_4$ attains in one case the value 8.37 and $MgCO_3$ in the same species 6.68. Older analyses show similar relations, except that the $CaSO_4$ seems to have escaped attention. Phosphatic brachiopods have probably played some part in the formation of P-bearing sediments. E. T. W.

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The rock formations of central New York. JOHN A. COGSWELL. *Chem. News* 112, 74–5(1915).—Analyses of specimens of the different formations are given, as follows: Salina: SiO_2 5.55, Al_2O_3 3.24, Fe_2O_3 0.90, $CaCO_3$ 41.45, $MgCO_3$ 48.57. Lower Helderberg: SiO_2 4.54, Al_2O_3 1.84, Fe_2O_3 0.3, $MgCO_3$ 12.68, $CaCO_3$ 80.45. Onondaga: SiO_2 6.45, Al_2O_3 5.35, Fe_2O_3 0.0, $CaCO_3$ 78.77, $MgCO_3$ 8.93. Marcellus: SiO_2 76.89, Al_2O_3 12.80, Fe_2O_3 5.31, $CaCO_3$ 1.30, $MgCO_3$ 3.86. Hamilton: SiO_2 67.79, Al_2O_3 12.26, Fe_2O_3 4.84, $CaCO_3$ 12.65, $MgCO_3$ 2.59. The sp. gr. of these rocks is, respectively, 2.62, 2.75, 2.78, 2.69, and 2.65. J. H. BOWER.

Pseudoclases. RAPHAEL E. LIESEGANG. Frankfurt. *Neues Jahrb. Min. Geol.* 39 (Beil. Bd., Bauer Festschrift), 268–76(1914).—It is shown that the apparent breaking and branching of the bands in certain agates are not an argument against L.'s hypothesis of the origin of agate by diffusion (*C. A.* 5, 3667, etc.), since identical phenomena occur in rings of Ag_2CrO_4 in gelatin, as well as in other cases of rhythmic pptn., without any actual breaking; these effects are therefore termed *pseudoclastic*. The canal structures in certain agates are also not opposed to this hypothesis, as they merely indicate that the agate filling was of more than one type, some of the material having entered by diffusion, and the rest of it along the canals; this can also be shown by expt. The apparently broken ends of the concentric rings in certain concretionary granites have been usually explained as due to resorption of ring-material by the magma, but the rings may also never have been complete; expts. with gelatin containing $AgNO_3$ on which are placed closely spaced drops of $K_2Cr_2O_7$ soln. show incomplete rings imitating the natural occurrence in a very striking way. The apparent driving of one part of an enhydro (geode containing water) into the other may be merely the result of osmotic pressure, as similar effects can be obtained by expt.; in one sense the term pseudoclase is not applicable here, as breaking has actually occurred; but the breaking is due to internal, not to external, foreign, forces. Other examples of the same sort are briefly mentioned. E. T. W.

Methods of naming crystal forms (MILCH) 2. Isogonism (PANEBIANCO) 2. Apparatus for oriented crystal grinding (GOLDSCHMIDT) 1. Field apparatus for determining ash in coal (LESHER) 21. Occurrence of explosive gases in coal mines (DARTON) 24.

DITTLER, E.: **Mineralsynthetisches Praktikum.** Dresden: T. Steinkopff. 150 ss. 6 M.

LEWIS, J. V.: **Determinative Mineralogy with Tables for the Determination of Minerals by Means of their Chemical and Physical Characters.** 2nd ed. New York: Wiley. 155 pp. $1.50.

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9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Callow pneumatic process of flotation. ANON. *Met. Chem. Eng.* 13, 571–2(1915).—An agitator operated by compressed air emulsifies oil, water, and air. Next is the rough sepg. cell, which is a wooden tank with sloping bottom made of 4 thicknesses of loosely woven canvas-twill supported by a perforated metal backing, through which compressed air is forced and agitates the liquor. Each cell has 8 compartments with sep. feed of air. The cleaner cells are identical with the rough. A 500-ton plant requires 30 h. p. for blowers, etc., and requires 6–8 lbs. free air per min. at 4–6 lbs. pressure. Each tank has an overflow pipe and float valve. Pulp to be treated may be

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of varying density (from $2^1/_2$ water to 1 ore up to 7 water to 1 ore). The oils used are coal tar or pine tar. Only a test can det. whether an ore can be treated by flotation. BERMAN.

Magnetic separation of zinc-iron sulfide ores. ANON. *Met. Chem. Eng.* 13, 573(1915).—Tests conducted by the Magnetic Separation Co. of Boston are described. Ore was roasted in a special kiln 3–5 min., then fed over a table in a thin layer, agitated and exposed to a magnet. Fe is removed and Zn flows over the end of the table. Recovery of metallic Zn was 95.4%. Zn in the Fe was 0.6 to 4%. Operating cost is low, little labor is required, and the process is adaptable to the lowest grade Zn ores. BERMAN.

Lead acetate and zinc salts in silver extraction. CHARLES R. MORRIS. *Eng. Mining J.* 100, 189–90(1915).—At the Mexican Mill, Virginia City, long mill tests on the continuous treatment plant were run with and without $Pb(OAc)_2$. The extn. of Ag was 3.2% better, the time of treatment was 18% less and consumption of cyanide 0.25 lb. more with the use of $Pb(OAc)_2$ than without. Only sufficient Pb or Zn salt in soln. should be present to ppt. the alk. sulfides. Tests made with new soln. and with mill soln. gave a max. extn. without the use of $Pb(OAc)_2$ at a diln. of 1:10. At a diln. of 1:2 (mill working concn.) the max. extn. was obtained with 1.5 lb. $Pb(OAc)_2$ with new soln. and with 0.25 lb. $Pb(OAc)_2$ on mill soln. L. P. WEBBERT.

The smelting and refining of lead. H. O. HOFMAN. *Trans. Intern. Eng. Congress* 1915 (advance copy), 5 pp.—Blast roasting, which may be defined as an enforced ordinary oxidizing roast accompanied by sintering, has revolutionized the details of Pb smelting. The reverberatory furnace has become obsolete for smelting high-grade concentrates, while the ore-hearth has maintained its place only in the reduction of the non-Ag ores of the Mississippi valley. In the 2 principal blast roasting processes, the Huntington-Heberlein and the Dwight-Lloyd, a rough-roast reduces the S content to 10–18% and the heat of oxidation of the charge is thereby kept within proper limits. Except in 1 or 2 refineries Ag and Pb are sepd. by the Parkes process. The treatment of blast-furnace matter has undergone some radical changes. By a new method, Pb-Cu-Fe mat is blown without the addition of silicious ore until the Pb and Zn have been volatilized to be collected in a baghouse. Meanwhile all the Fe and much of the Cu have been oxidized; the mixt. is transferred to a basic Cu-Fe mat-converter working in the usual way, while the lead blast-furnace has to treat only the Pb fume from the baghouse. At Garfield, Utah, the Cottrell system is in use for pptg. Pb fume. H. L. OLIN.

The advantages of high-lime slags in the smelting of lead ores. S. E. BRETHERTON. *Bull. Am. Inst. Mining Eng.* 1915, 1595–1600; *Mining Eng. World* 43, 257–8(1915). —The use of high lime and low Fe to neutralize the excess of silica in ore was introduced in 1878–79 by Anton Eilers to replace the use of high Fe and low lime. The advantages of using high lime are the prevention of so-called "sows" in the Pb crucible and the production of less speis. B. states that with the use of a high-lime base and with a lack of Fe a comparatively clean slag is obtained together with a volatilization of As, this volatilization being assisted by the oxidizing influence of the PbO used. In part of his practice B. cupelled his bullion for shipment until it was rich in Au and Ag so as to use the PbO over again in the charge. L. P. WEBBERT.

A rule governing cupellation losses. W. J. SHARWOOD. *Bull. Am. Inst. Mining Eng.* 1915, 1671–6.—For a fixed amt. of precious metal the cupellation loss varies with amt. of Pb used, with the nature and amt. of the impurities, with the porosity of the cupel, with the air supply and above all with the temp. at which cupellation is carried on. S. gives the following empiric rules: When a given amount of Ag (or of

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Au) is cupelled with a given amt. of Pb, under a fixed set of conditions as to temp., etc., the apparent loss of wt. sustained by the precious metal is directly proportional to the surface of the button of fine metal remaining. If the preceding rule is true the loss of wt. varies as the $^2/_3$ power of the wt., or as the square of the diam. of the button. The % loss varies inversely as the diam. of the button, or inversely as the cube root of the wt. If a series of cupel losses on buttons of various sizes carefully cupelled in the same row is plotted on logarithmic paper on which the X axis represents the wts. of a series of Ag buttons cupelled under precisely similar conditions and the Y axis represents the corresponding losses, it will be noted that the points corresponding to the losses fall on a straight line. The above rule is applied by first drawing a guide line y (wt. lost) $= x^{3/2}$ which is a straight line. An approx. correction may be obtained for an ore if one proof, as near the expected wt. as possible, is cupelled in each row and its exact loss noted. The corresponding point is plotted on the diagram and a line is drawn through this point parallel to the guide line. Noting the points on the line corresponding to other wts. the correction for each can be read from the scale.

L. P. WEBBERT.

Metal losses in copper slags. I. FRANK E. LATHE. *Eng. Mining J.* 100, 215–7 (1915).—A résumé of the most important literature on the subject. Diagrams showing the variation of Cu in slags under different conditions are given. II. *Ibid* 263–8.—L. describes the steady progress made from 1907 to 1914 in reducing Cu losses at the Grand Forks, B. C., plant of the Granby Con. Mining, Smelt. and Power Co., Ltd. After the furnaces had been deepened, the mat averaged 34.45% Cu and the slag Cu 0.216, SiO_2 45.07, FeO 19.29, CaO 22.64, Al_2O_3 8.98, MgO 3.60%. This av. represents a period of 3 yrs. From the figures obtained from the weekly av. detns., curves are given showing the decrease of Cu as Si in the slag increased for mats of 28–34% and 35–40% Cu and the increase of Cu in the slag with the grade of mat for slags of 43.0–44.4% SiO_2, 44.5–45.4%, and 45.5–47.4%. Averages from daily data were also calcd. for mats of 27–35%. Slags of not more than 45% SiO_2 were more fluid and responded more to the additional opportunities for settling than more highly siliceous slags. The % of CuO in slags calcd. from the Au content agreed very closely with that detd. by the following method: Digest 2 g. at 60–80° for 2–3 hrs. with 150 cc. H_2SO_4 (1–20); then electrolyze without filtering. Dissolve the Cu in weak HNO_3 and redeposit. The sulfide was found by difference. Detn. of total Cu was made in the usual way on another sample. Normal slags in 1914 gave: SiO_2 47.0, FeO 17.1, CaO 22.2, total Cu 0.195, oxide Cu 0.115, oxide ratio 62.5:100. Both the sulfide and oxide Cu have been reduced in quantity and their proportions changed. Figures showing slag results from the operations of 3 basic converters for one week are: SiO_2 21.85, S 1.40, total Cu 1.73, oxide Cu 1.39, oxide ratio 80.3:100. Air-cooled slags were analyzed as follows: warm 2 g. of slag for 10 min. in a tall 200 cc. beaker with 6 cc. HNO_3, add 2 cc. HF and heat until action ceases. After cooling, add gradually 8 cc. H_2SO_4 and transfer to a Pt crucible and evap. to fumes. When cool transfer to a beaker, dil. to 150 cc. and with the addition of 2 cc. HNO_3 electrolyze without filtering. Redissolve the pptd. Cu in 2 cc. HNO_3 and again electrolyze. Expts. with Anaconda slags were carried out on reverberatory and blast furnace slags. The results are plotted and compared with Granby practice. Four expts. were successfully made establishing clearly the fact that the presence of CuS in molten furnace products does not prove the absence of either CuO or silicate. They also indicate that the silicate is reduced with more difficulty than the oxide. III. *Ibid* 305–8.—Losses of suspended mat particles may be reduced by securing greater fluidity in the slag (by change of temp. or compn.), by lowering its sp. gr. or by coagulation of mat particles. Increase in SiO_2, within reasonable limits, the presence of FeO, Al_2O_3 or MgO within certain

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limits, and replacement to a great extent of FeO by CaO favorably affect the chemical compn. ZnO in the slag is detrimental. BaO has no effect. Not less than 3 settlers in series give the best com. results for settling mat particles. In any particular case the degree to which the slag in the furnace has been superheated will largely det. the length of time during which it may be subsequently treated. A 37–38% mat is desirable unless it can be reduced below 32%. The loss in suspended mat is not more than 25–50% of the total loss in the slag. The existence of CuS in determinable quantities in slag has not yet been proved. Oxidized Cu may be present in slags as Cu_2O or CuO or as silicate. In all normal furnace slags tested, although made under different conditions, 0.5–0.75 of the Cu lost was present in the slag as oxide or silicate and not as sulfide. L. P. WEBBERT.

Cyanide process. Crushing and grinding. L. D. MILLS AND M. H. KURYLA. *Trans. Intern. Eng. Congress* 1915 (advance copy), 11 pp.—The trend of recent practice is strongly toward 2-stage primary crushing, using first a large-size Blake or jaw crusher, following with cone crushers to reduce to 2-in. ring. Beyond this stage dry crushing is not usually carried. In American practice the gravity stamp is being supplanted by the newer types of ball mills. For fine grinding to finished product the use of tube mills with 40% or more moisture has become almost universal. H. L. OLIN.

Cyanide process. Solution of gold and silver including classification. M. H. KURYLA. *Trans. Intern. Eng. Congress* 1915 (advance copy), 20 pp.—A discussion of the efficiencies and costs of the various methods of amalgamation, concentration, and cyanide treatment of Au and Ag ores. H. L. OLIN.

Cyanide process. Filtration or separation of metal-bearing solution from slime residue. L. D. MILLS. *Trans. Intern. Eng. Congress* 1915 (advance copy), 21 pp.—A discussion, with cost data, of the various processes and machines for thickening, filtering, and decanting slimes. M. concludes that the handling of slime obtained in the KCN process has reached a point where no further radical changes should be expected. The sepn. of metal from the treated residue, under favorable conditions, may now be effected at a cost of 5 cts. per ton and recoveries of 98 and 99% are not unusual. A bibliography is appended. H. L. OLIN.

Cyanide process. Precipitation. G. H. CLEVENGER. *Trans. Intern. Eng. Congress* 1915 (advance copy), 35 pp.—A descriptive review of the diff. processes. The cost of electrolytic pptn., both in installation and operation, is greater than that of Zn pptn., but cases may arize in which it is the only practicable method. Al dust processes have been installed in 3 commercial plants only, and these have been used solely for pptg. Ag solns. Small scale tests on Au solns., however, seem to indicate that it is less efficient than Zn dust. The Zn shaving method, the first commercial process, is still much used, but the substitution of Zn dust is rapidly gaining favor because of lower operating costs as well as its superiority for solns. containing Cu. An extensive bibliography is appended. H. L. OLIN.

The open hearth versus the electric furnace in the manufacture of commerical steels. S. CORNELL. *Met. Chem. Eng.* 13, 630–1(1915).—A comparison is made of records for an open-hearth plant consisting of 80-ton furnaces, having a production of about 200 tons of ingots per day for each furnace, with records for a 20-ton elec. furnace having approx. the same capacity per day. C. concludes that until the cost of power is reduced to less than $0.001 per kw.-hr., the elec. furnace can not compete with the open-hearth in the manuf. of steel for rails, structural shapes, merchant bars, etc. Tables showing costs data are given. F. W. SMITHER.

Reduction works, Copper Queen Consolidated Mining Company, Douglas, Arizona. FORREST RUTHERFORD. *Trans. Intern. Eng. Congress* 1915 (advance copy), 4 pp.—A

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history of the growth of the plant, which now includes 10 blast and 3 reverberatory furnaces, 16 McDougall roasters, seven 12-ft. converter stands and 5 ore pits. 4500 tons of ore can be treated per day. H. L. OLIN.

Metallurgy of copper in Japan. R. KONDO. *Trans. Intern. Eng. Congress* 1915 (advance copy), 7 pp.—K. describes a typical refinery located at Ashio, producing 11,000 tons of Cu annually from 111,000 tons of chalcopyrite and pyrite ore. Lumps in the raw state, or fines after being sintered in a pot furnace or briquetted, are fed into rectangular water-jacketed blast furnaces with the charge so calcd. as to obtain a 40% Cu mat and a slag of SiO_2 36–38%, CaO 18–20%, Cu 0.20–0.25%, FeO 28–30% and Al_2O_3 7–8%. For lining the converter a mixt. of decomposed liparite and slag is used and a 99% blister Cu is obtained. Dust is removed from the fumes by pptn. while SO_2 is washed with $Ca(OH)_2$ spray. H. L. OLIN.

The Rochester mill, Nevada. G. W. WOOD. *Mining Sci. Press* 111, 317–20 (1915).—W. describes a continuous counter-current decantation plant operating on Ag ore, using Dorr thickeners exclusively without a filter. L. P. WEBBERT.

Amador consolidated milling plant, Amador City, Calif. T. S. O'BRIEN. *Eng. Mining J.* 100, 255–7(1915).—Amalgamation is carried out in Hardinge ball mills instead of at the stamps. Description of treatment and machinery is given. L. P. WEBBERT.

Flotation at the Central Mine, Broken Hill (New South Wales). JAMES HEBBARD. *Mining Sci. Press* 111, 347–53(1915).—The flotation process of concentration introduced and perfected at Broken Hill is described. Finely powdered ore suspended in acidified water is mixed with about 1% of oleic acid, heated and agitated until the oil-coated minerals form into a froth which can be sepd. from the gang by flotation. Spitz boxes are used to sep. the frothy mineral from the sands and gang slime. The results obtained on the total concentrates are: prop. 50.1%; recoveries: Ag 92.7%, Pb 94.1% and zinc 91.8%. L. P. WEBBERT.

Lead smelting at El Paso. H. F. EASTER. *Bull. Am. Inst. Mining Eng.* 1915, 1493–1506.—Ores have tended to increase in Si and decrease in Fe, the latter deficiency having been met by the use of large amts. of leady Cu mat from the Chihuahua Smeltery and converter slag from El Paso converters. These materials including complex Pb-Cu ores from Bisbee, Ariz., have introduced a most unusual amt. of Cu into Pb smelting at the El Paso smelting works. One-tenth sample from the fines of each car is taken; all lumps over about 6 inches diameter are sampled in automatic sampling machines (Vezin samplers). The sample is then sent to 2 identical sampling machines each of which delivers samples of about 400–500 lbs.; each sample is finished up and assayed separately. After being passed through finishing rolls, the samples are circled, coned, spread and quartered by hand until the desired sample is obtained. The shovel cut is dispensed with in sampling mat and large lumps. Concentrates are entirely cut by shovel, $1/10$ or $1/8$ according to the grade. A typical mixt. for the roasters consists of a mixt. of ore and leady Cu mat. The material is fed mechanically into 3 Godfrey roasting furnaces 26 ft. in diameter with a capacity of 30 tons each per 24 hrs. This roasting brings the S in the charge from 21% down to 10–12%. The roasted material is conveyed to Huntington and Heberlein pots each handling 6–7 tons per 24 hrs. and operating at a max. pressure of 10 oz. The final S in the sintered material is about 5%. A detailed description of the blast furnaces is given. There are 6 lead blast furnaces, three of which are kept in operation, and one Cu furnace. The av. capacity is 180 tons per furnace day. The charge is made up of ore, both raw and roasted, limestone, coke, scrap iron, dry dross and other furnace products. The development of the settling

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furnaces for sepg. the leady Cu mat from the slag is described in detail. The following figures are given as representative of the Pb smelting practice of the plant: Av. analysis of slag: SiO_2 33.7, FeO 27.9, MnO 1.4, CaO 22.9, ZnO 4.6, Al_2O_3 5.2, Ag 0.6, metallic Pb 1.50, Cu 0.15%; the leady Cu mat Fe 42.1, Pb 12.1, Cu 19.8, Zn 4.6, S 21.4%; Au 0.04 oz., Ag 87.8 oz., av. grade of bullion Au 3.24, Ag 247.6. The mat averaged 8% of the total charge. Pb on the charge averaged 15.7% and S 2.2%. Coke used averaged 14.2%. The high Cu in the leady Cu mat as shown by the above figures is characteristic of the unusual conditions at this plant. Each day's production of leady Cu mat is disposed of according to its assay. It either goes to the converters or is sent to be roasted and resmelted. Most of the mat has been sent to the converters even though its Cu content did not run higher than 20%. The bullion is poured into a cast Fe cooling pot for sampling, well stirred and carefully skimmed. After skimming, the mass is stirred again and while the Pb is in motion "gum drop" samples are dipped, one gum drop for each bar of Pb to be cast. A shipment consists of 780 bars (about 42 tons). The 780 corresponding gum drops are melted into a homogeneous mass from which the final gum drop samples (wt. about 40 g. each) are taken. These gum drops are then assayed and the Au and Ag calcd. to an assay ton basis. L. P. WEBBERT.

Slime agitation and solution replacement methods at West End Mine, Tonopah, Nev. J. A. CARPENTER. *Bull. Am. Inst. Mining Eng.* 1915, 1639–52; *Met. Chem. Eng.* 13, 671–6(1915).—C. describes the application of the Trent agitator to the replacement of pregnant soln. with a minimum amt. of barren soln. in the treatment of slime that is not too colloidal. The development of the replacer is described in detail. A 1:1 pulp is established in the bottom 6 ft. of the tank; above this a sharp change to thin pulp takes place and at the top of the tank clear soln. is obtained. The new pulp entering the tank enters on the surface, causing only a ripple. The solid content settles through the clear zone into the thick pulp below and the clear soln. overflows into a launder. The barren soln. fed in at the bottom finds no rizing current and being mixed with the pulp is discharged as an integral part of the discharge pulp. The replacement of the dissolved Ag entering the tank is over 90%. The advantage of the replacer over the thickener-dilution method is in the smaller installation required and the small amt. of barren soln. used. L. P. WEBBERT.

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OSANN, B.: **Leitfaden für Giessereilaboratorien.** Berlin: J. Springer. 34 ss. 1.60 M.

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SKINNER, E. N., AND PLATE, H. R.: **Mining Costs of the World.** New York: McGraw-Hill Book Co. 406 pp. $5.00.

SMITH, S. W. G., AND GUILD, J.: **Thermomagnetic Study of the Eutectoid Transition Point of Carbon Steels.** London: Dulau. 28 pp. 2 s.

Aust., 4,867, May 28, 1914. F. KAMMERER. **A cadmium-zinc alloy contains** at most 1% of an alloy of Cd 75, and Zn 25, and a further addition of 0.1% of phosphor-Cu. The tensile strength of the product is increased by these additions, and its elasticity is sufficient for the manuf. of conducting wires.

Brit., 12,011, May 15, 1914. POLDIHUTTE TIEGELGUSSSTAHLFABRIK. A process of **rendering manganese steel capable of being easily machined** consists in heating

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the casting or other article to 350–800°, or preferably 550–675°, maintaining such temp. for some time, and then cooling in any suitable way. The heating may be effected in cast-Fe filings, sand, ashes, lime, etc. After machining, the article may be hardened at above 900° in oil, H_2O, etc.

Brit., 12,045, May 15, 1914. A. SAMUEL. In a process of **coating iron with lead**, the Fe is coated with linseed oil and a mixt. of PbO and powdered Al, a blowpipe flame being then passed over the coated surface, whereupon the PbO is reduced to metallic Pb.

Brit., 12,135, May 16, 1914. W. THUM. In a process of **separating bismuth and copper** from materials consisting mainly of these metals, the material is oxidized, if not already in that condition, crushed, and intimately mixed with an alkali S compd. and C and smelted to produce Cu mat and crude metallic Bi, which are tapped off separately from the furnace. The amts. of alkali S compd. and C employed are largely in excess of the quantities theoretically necessary to reduce the Bi and convert the Cu mat. If the crude Bi is not sufficiently free from Cu, it is again oxidized, and the product is smelted with a further quantity of alkali S compd. and C, the resulting metallic Bi being sepd. from the resulting Cu mat. If the original material contained other metals, such as Ag and Au, these metals are mainly contained in the crude Bi; the reoxidation of this metal may be stopped when a small portion only of the Bi remains unoxidized, the Au and Ag being thereby recovered in metallic form and subjected to refining treatment. If the crude Bi contains only small quantities of Au, Ag, and Cu, it may be refined electrolytically, the Au and Ag being thereby recovered. Cf. *C. A.* 8, 2666.

Can., 163,307, June 22, 1915. B. R. KOERING. **Process of treating ores** by adding a metal-extg. soln., tumbling the ores in contact with the soln., filtering during the tumbling operation, and withdrawing the filtered soln. containing the dissolved metals.

Can., 163,327, June 22, 1915. J. R. C. MARSH. **A composition of matter for treating metals** consisting in an alloy containing ferro-boron, ferro-vanadium and copper.

Can., 163,622, July 6, 1915. F. P. ARNOLD. **The process of treating ores** by expanding live steam, drawing off the H_2O of condensation, superheating the dry steam and passing the gas thus formed through comminuted ore impregnated with neutralizing agents.

Can., 164,027, July 27, 1915. V. ROY. **Composition for tinning aluminium** containing Sn 0.5 lb., Zn 5 oz., Pb 3 oz., and $Na_2B_4O_7$ 60 grains.

Ger., 284,241, Mar. 4, 1913. SIEMENS & HALSKE. **A tantalum alloy having the appearance of gold** is made by alloying Au or Cu, or both metals, with Ta. The metal to be alloyed is intimately mixed in powdered form, compressed to form coherent bodies under high pressure and placed in a crucible or quartz tube and heated to a white heat. The heating can be effected, *e. g.*, by means of arcs formed between Ta electrodes, or in an arc formed between a Ta electrode and a lower electrode of the metal to be alloyed with Ta. Resistance heating may be employed; either the elec. current is conducted through the material, or the tube or the crucible is surrounded with granular W or Ta, and the elec. current passed through it. The heating is effected preferably in an indifferent atm. or *in vacuo*, especially when small amts. of the material are to be fused. The alloy can be used as a Au substitute for many purposes, but it is harder and more elastic than Au. The alloy does not oxidize at so low a temp. as does pure Ta.

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10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

Franz Kunckell. A. MICHAËLIS. *Chem. Ztg.* 39, 669(1915).—Died Aug. 9, 1915. J. H. MOORE.

A. P. N. Franchimont. H. J. BACKER. *Chem. Weekblad* 11, 382–91(1914).—A brief biography and a bibliography. Franchimont was born 1874 and died May 2, 1914. E. H.

Synthesis of glucosides. H. ENGELHARDT. *J. Am. Pharm. Assoc.* 4, 670–4 (1915).—A review of recent work by Bourquelot and others. M. I. W.

Hydroaromatic compounds with *gem*-dialkyl groups. K. v. AUWERS AND E. LANGE. Univ. Greifswald and Marburg. *Ann.* 409, 149–82(1915); cf. *C. A.* 8, 496. —*1-Methyl-1-dichloromethylcylcohexane*, obtained by the action of Zn-Pd, HCl and EtOH upon the corresponding hexanone, easily mobile oil, b_{18} 99°, $d_4^{23.85}$ 1.1271, d_4^{20} 1.131, n_α 1.48670, n_D 1.48947, n_β 1.49596, n_γ 1.50145 at 23.7°, n_D^{20} 1.4911. 1,1-Dimethylcyclohexane was prepd. from the 2-Br deriv. by reduction with Zn-Pd and concd. HCl, but could not be obtained pure. In the same way Zn dust and EtOH gave a mixt. of satd. and unsatd. compds. This was partially purified by shaking with $KMnO_4$. The product b. 125° (earlier b. p. 119.2°, 120°). This may not be entirely pure. *1,1-Dimethyl-3-cyclohexene*, obtained by the action of P_2O_5 upon $HOC_8H_9Me_2$, easily mobile oil, b_{767} 119.5–121.2°, b_{760} 120–122°, d_4^{20} 0.803, n_α 1.44251, n_D 1.44521, n_β 1.45182, n_γ 1.45722 at 16.2°, n_D^{20} 1.4435. Upon oxidation with $KMnO_4$ in acetone, only β,β-dimethyladipic acid could be isolated. The action of O_3 gave impure products, probably the above acid and its dialdehyde. *1,1,4-Trimethyl-3-cyclohexene*, prepd. by warming the corresponding alc. with 10 parts anhydrous HCO_2H 1 hr., or better by warming with 1.5 times its wt. of dry $(CO_2H)_2$ at 140° in a stream of CO_2, with a yield of 90%, easily mobile oil with an aromatic odor, b. 140°, b_{21} 44.4°, b_{14} 37°, $d_4^{15.1}$ 0.8096, d_4^{20} 0.806, n_α 1.44643, n_D 1.44921, n_β 1.45591, n_γ 1.46164 at 15.1°, n_D^{20} 1.4469. Concd. H_2SO_4 gives a blood-red soln. *Nitrosochloride*, compact, glass-like rhomboids from abs. alc., felt-like needles from hot AcOEt, m. 118–22°, depending upon the rate of heating. *Dibromide*, heavy oil, b_{10} 120–20.5°, not affected by $KMnO_4$, $d_4^{18.7}$ 1.532, d_4^{20} 1.530, n_α 1.52474, n_D 1.52805, n_β 1.53642, n_γ 1.54354 at 18.7°, n_D^{20} 1.5275. *Hydrobromide* (*1,1,4-trimethyl-4-bromocyclohexane*), obtained by satg. the alc. in 5 parts AcOH with HBr gas and allowing to stand 24 hrs., b_{17} 77–9°, cm.-long prisms, m. 27–8°, $d_4^{17.6}$ 1.1698, d_4^{20} 1.167, n_α 1.47721, n_D 1.47995, n_β 1.48710, n_γ 1.49311 at 17.4°, n_D^{20} 1.4788. Attempts to prep. the cyclohexane by reduction of the Br deriv. gave a mixt. of satd. and unsatd. compds. which could not be sepd. with the small amt. of material. Upon oxidation with O_3 the hexene yields *1,1-dimethyl-3-aceto-3-cyclopentene*, isolated as the alkali-insol. *semicarbazone*, fine needles, m. 217°, and *β,β-dimethyl-δ-acetylvaleric acid*, b_{15} 172°, b_{17} 178°, $d_4^{14.3}$ 1.0374, d_4^{20} 1.032, n_α 1.45646, n_D 1.45894, n_β 1.46516 at 14.3°, n_D^{20} 1.4564. *Semicarbazone*, small glass-like leaflets and needles, m. 156–8°. *1,4-Dimethyl-1-dichloromethyl-3-cyclohexene*, obtained by boiling the corresponding tertiary alc. with 10 parts 98% HCO_2H 1–2 hrs., b_{16} 110–10.5°, d_4^{23} 1.1227, d_4^{20} 1.125, n_α 1.49622, n_D 1.49913, n_β 1.50650, n_γ 1.51275, n_D^{20} 1.5005. *1,1,2-Trimethyl-2-cyclohexene*, prepd. from the carbinol and $(CO_2H)_2$, b_{740} 147.2–50°, $d_4^{20.3}$ 0.8217, d_4^{20} 0.822, n_α 1.54336, n_D 1.45603, n_β 1.46298, n_γ 1.46877. *Nitrosochloride*, fine needles with pearly luster, m. 133–4°. Oxidized with O_3 it yields $AcCMe_2CH_2CH_2CH_2CO_2H$. *1,1,4,4,-Tetramethyl-2-cyclohexanol*, prepd. by the action of Na in moist Et_2O upon the 1,1-Cl_2 deriv., b_{745} 201.5–3°, b_{20} 98–101°, fine prisms, m. 53°, $d_4^{30.2}$ 0.8935, d_4^{20} 0.902, n_α 1.45471, n_D 1.45714, n_β 1.46295, n_γ 1.46777 at 30.2°, n_D^{20} 1.4617. *1,1,4,4,-Tetramethyl-2-cyclohexanone*, by oxidizing 11 g. of the hexanol with 18.5 g. $K_2Cr_2O_7$, 16.6 g.

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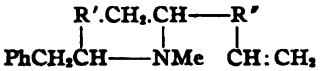
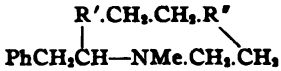
concd. H_2SO_4 and 92 g. H_2O, b_{16} 77°, b_{758} 190.4°, d_4^{14} 0.8934, d_4^{20} 0.888, n_α 1.44650, n_β 1.45482, n_γ 1.45987 at 14.0°, n_D^{20} 1.4459. *Semicarbasone*, crystal powder, m. 202–4°. *1-Methyl-1-dichloromethyl-4,4-diethyl-2-cyclohexanone*, obtained by the action of EtMgI from 4.5 g. Mg, 28.8 g. EtI and 200 cc. Et_2O upon 10 g. 1-methyl-1-dichloromethyl-4-ethyl-3-cyclohexen-2-one, b_{20} 168–72°, flat prisms, m. 65°. *1,1-Dimethyl-4,4-diethyl-2-cyclohexanol*, oil with camphor odor, b_{11} 117–8°, b_{20} 131.5–33°, $d_4^{13.6}$ 0.9196, d_4^{20} 0.915, n_α 1.47367, n_D 1.47588, n_β 1.48213, n_γ 1.48715, n_D^{20} 1.4730. *1,1-Dimethyl-4,4-diethyl-2-cyclohexanone*, oil with odor of camphor, b_{10} 103–4°, b_{742} 233–5°, $d_4^{15.2}$ 0.9112, d_4^{20} 0.907, n_α 1.46086, n_D 1.46307, n_β 1.46914, n_γ 1.47419 at 15.1°, n_D^{20} 1.4609. *Semicarbazone*, fine needles, m. 157–8°. C. J. West.

Action of benzoic acid upon dimethylaniline. Karl Neundlinger. Univ. Erlangen. *Ann.* 409, 182–7(1915); cf. *ibid* 206, 88(1881).—The action of BzOH upon $PhNMe_2$ in the presence of P_2O_5 leads to the production of *benzoylmonomethylaniline*, b_{12} 195°, *dimethylaminobenzophenone*, m. 92°, and *tetramethyldiaminodiphenylmethane*, m. 90.5°. C. J. West.

Berberine. II. Martin Freund and Karl Fleischer. Univ. Frankfurt. *Ann.* 409, 188–267(1915); cf. *C. A.* 7, 2197.—The earlier discussed formulas for des-*N*-methyl-*R*-dihydroberberine are incorrect. (In the following formulas R′ = $(MeO)_2C_6H_2<$, R″ = $CH_2{:}O_2{:}C_6H_2<$.) In the prepn. of larger amts. of des-*N*-methyl-1-benzyltetrahydroberberine, a 2nd base, *allodes-N-methyl-1-benzyltetrahydroberberine* (I), is formed, tables from alc. and $CHCl_3$, m. 138–40°. *Methiodide*, by warming 3 g. (I) with 4 cc. MeI 3 hrs. at 100° under pressure, gray cryst. powder, m. 197° (decompn.).

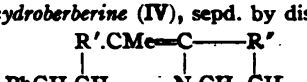


(I)

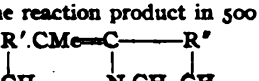


(II)

Shaken with Ag_2O the MeI deriv. gives a strongly alk. amorphous compd. Reduced with Pd and H, (I) forms the *allohydrodes-N-methyl-1-benzyltetrahydroberberine*, pointed prisms, m. 156–7°; this contains 2 H more than (I). The earlier described isohydrodes-*N*-methylbenzyltetrahydroberberine probably has formula (II). *α-Des-N-methyl-1-isopropyltetrahydroberberine methiodide*, by heating the components at 100° under pressure, light yellow rhombic tables, m. 259°, very sensitive to light. **Benzyldihydroberberine.** The compd. obtained by the action of MeI upon 1-benzyldihydroberberine, considered as des-*N*-methylbenzyldihydroberberine, has been shown to have no Me attached to N, and must therefore be considered as *1-benzyl-4-methyldihydroberberine* (III); *methiodide*, slightly yellow crystals, m. 245°. The action of Ag_2O and KOH gives *des-N-methyl-1-benzyl-4-methyltetrahydroberberine* (*a*) (β-hydrodes-*N*-methylbenzyldihydroberberine), m. 126°. Oxidized with $Na_2Cr_2O_7$ in AcOH this yields hydrastinine and a *compound*, pointed tables, m. 168–71°, neutral, N-free, containing 78.4% C and 8.24% H. The action of Ag_2O + KOH upon (*a*)-MeI gives an ammonium base, which, boiled with alkalies, gives the des-base, which could not be crystd. $PhCH_2MgCl$ reacts with 4-methylberberine-HI to give (III). **Dihydro- and tetrahydroberberine.** Dihydroberberine (*B*) was prepd. by warming 100 g. berberine sulfate with 500 cc. 10% H_2SO_4 on the H_2O bath for 7 hrs., extg. 5 such lots 7–8 times with a total of 5.5 l. 10% HCl, filtering from undissolved hydroxyberberine and recrystg. from 300 cc. H_2O and then dissolving in 200 cc. alc. and treating with satd. alc. NH_3. The yield is about 100 g. 20 g. (*B*) warmed with 20 cc. MeI 9 hrs. at 45–50° gave 7.7 g. *4-methyldihydroberberine* (IV), sepd. by dissolving the reaction product in 500 cc. 50°



(III)



(IV)

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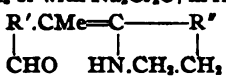
alc., satg. with 10% NH_3 and adding 200 cc. H_2O; yellow, flat columns from alc. containing some $CHCl_3$, sinters 115°, m. 121–2°. *Hydriodide*, felt-like needles, m. 205-6° (decompn.). The mother liquor gives 8.9 g. *dihydroberberine methiodide*, yellow, m. 223–4° (decompn.). EtI, reacting upon (IV), gave only *4-ethyldihydroberberine*, light yellow, long, pointed prismatic tables, color at 160°, sinter and m. 194–5°. *4-Methyldihydroberberine methiodide*, light yellow prisms, m. 157–8° (decompn.). By the action of Ag_2O and KOH this yields *des-N-methyl-4-methyldihydroberberine* (*C*), partly cryst., decomps. about 100°. *Hydriodide*, light yellow powder, m. 208–9° (decompn.). *Methiodide*, m. 143° (decompn.). With Ag_2O this gives a strongly alk. soln. which does not split off Me_3N when boiled with alkalies. Reduced in alc. 30% H_2SO_4 with a Pb cathode (15 amp. at 30–40°) (*C*) gives *tetrahydrodes-N-methyl-4-methyldihydroberberine*, isolated as the *hydrochloride*, rods, m. 235°. (IV), reduced with HCl and $SnCl_2$, gave *4-methyltetrahydroberberine* (*D*), glistening, long columns, m. 211–2°. Pd and H does not reduce (IV). Reduced electrolytically 10 g. (IV) gave 4.2 g. (*D*) and 2.4 g. *pseudo-4-methyltetrahydroberberine* (*E*), long, pointed tables, m. 110–2°. (*D*) treated with Br in $CHCl_3$ gives (IV), while (*E*) is not changed. (*D*) *methiodide*, yellow tables, m. 247° (decompn.). With Ag_2O and KOH this yields *des-N-methyl-4-methyltetrahydroberberine*, flat prisms, m. 160–2°. *Methiodide*, needles, m. 200°. The compd. obtained by reacting with Ag_2O is a half-solid, dark gray mass, which does not split off amines when boiled with KOH. (*E*) gives a *methiodide*, decomp. 267–8°. Treated with Ag_2O and KOH this gives *pseudodes-N-methyl-4-methyltetrahydroberberine*, long columns, m. 104–6°. *Hydrochloride*, columns, m. 241° (decompn.). Upon oxidation with I in $CHCl_3$ or with $Na_2Cr_2O_7$ in AcOH, *4-methylberberinal* (V) is formed, amorphous,



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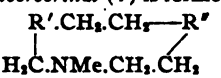
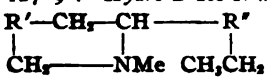
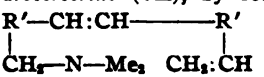


(VI)

sinters 180°, m. 190° (decompn.). *Hydriodide*, yellow needles, m. 244° (decompn.). *Hydrochloride*, brownish yellow compact tables, decomps. above 190°. It contains 1 mol. H_2O which is removed at 130°. *Cyanide*, light yellow powder, m. 164–5°. Reduced electrolytically, (*D*) and (*E*) are formed. *1-Ethylberberinal*, decomps. about 90°. Tetrahydroberberine was obtained by the electrolytic reduction of berberine-H_2SO_4. *A*-(*F*) and *B*-des-*N*-methyltetrahydroberberine (*G*) were obtained by the action of Ag_2O and KOH upon the MeI deriv. of tetrahydroberberine. *Hydro-A-des-N-methyltetrahydroberberine* (VI), by electrolytically reducing (*F*), pointed prismatic tables, m. 127–9°. *Hydro-B-des-N-methyltetrahydroberberine* (VII), by reducing (*G*)



(VII)



(VIII)

with Pd and H, needles, m. 102–2.5°. *Hydrochloride*, needles, m. 260° (decompn.). (*G*) *hydrochloride*, needles, m. 253° (decompn.). *Methiodide*, needles, m. 228° (decompn.). With Ag_2O and KOH this yields *B-des-N-dimethyltetrahydroberberine* (VIII), needles, m. 97.5°. By the reduction of dihydroberberine-MeI electrolytically, there results a mixt. of products from which the tetrahydro-MeI compd. was isolated. *Hydrodes-N-ethyltetrahydroberberine*, by reduction of des-*N*-ethyltetrahydroberberine, prisms, m. 103–5°. **1-Ethyldihydroberberine.** With Heinrich Herminghaus. *1-Ethyl-4-hydroxydihydroberberine*, prepd. by passing O_2 through a boiling soln. for 2 hrs., long, glistening, light brown needles, from MeOH, m. 191–2° and contains 1 mol. MeOH; yellow prismatic tables from C_6H_6, m. 166°. *Hydrochloride*, felt-like, brown needles, m. 203°. Upon drying, the color changes to a pure yellow. *Hydriodide*, yellow needles, m. 168–9°. *Methiodide*, columns, m. 189°. *1-Ethyl-4-methylberberinal hy-*

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drate (*H*), obtained by the action of $Na_2Cr_2O_7$ upon the corresponding dihydroberberine, amorphous, m. 130°. *Hydrochloride*, fine needles, m. 225°, contains 2 mols. H_2O. *Hydriodide*, small tables, m. 221°. *Cyanide*, small, well formed spears, m. 220° (decompn.). HCl liberates HCN and gives the HCl salt. *Methyl alcohol compound*, needles, m. 115°. Reduced by the elec. current a mixt. of 1-ethyl-4-methyltetrahydroberberine (*I*), m. 137°, and the pseudo base, m. 245°, was obtained. *1-Ethylidene-4-methyldihydroberberine*, by boiling (*H*) in abs. alc. with KOH, safron-yellow pyramids, m. 185–6°. *Hydrochloride*, fine needles, m. 195–6°, easily sol. in alc. and H_2O. *Hydriodide*, needles, m. 220°, easily sol. in alc. This is also formed by heating (*H*) with excess of MeI at 100°. HCl and $SnCl_2$ reduce it to (*I*). *Methiodide*, small tables, m. 235°. NaOH gives *N-methyl-1-ethyl-4-methylberberinal*, amorphous. *Methochloride*, fine needles, m. 200–1°. **1-Propyldihydroberberine and acetoneberberine.** With PAUL WALBAUM. *1-Propyl-4-methyldihydroberberine* (*J*), irregular leaflets, m. 129–31°. *Hydriodide*, citron-yellow quadratic tables, m. 224–7° (decompn.) *1-Propyl-4-methylberberine pseudocyanide*, prepd. by oxidizing (*J*) in AcOH with $Na_2Cr_2O_7$ and adding an excess of KCN, rectangular tables, decomp. 194°, containing 1 mol. H_2O. *1-Propyl-4-methylberberinal hydrate*, by oxidizing with air in H_2O, slightly yellow, m. 121–3° (decompn.). *Hydriodide*, light yellow, decomp. 208°. *Nitrate*, rectangular leaflets, decomp. 214°. *Sulfate*, felt-like needles. The *free berberinal*, obtained by boiling the hydrate with MeOH, EtOH, or $C_5H_{11}OH$ or with alc. caustic alkali, deep yellow, m. 194°. *Hydriodide*, yellow leaflets, m. 214° (decompn.). *Sulfate*, yellow columns, m. 229° (decompn.). *1-Acetone-4-methyldihydroberberine hydriodide*, prepd. by heating acetoneberberine with MeI at 100° under pressure, deep yellow needles, decomp. 251°. Reduced with HCl and $SnCl_2$ it yields (*D*). The stereochem. relationship of the various isomers is discussed, and space formulas proposed for the different compds. Various changes are suggested in the names of the compds. earlier described, depending upon the fact that in many of them there is no Me group attached to the N.

C. J. WEST.

Synthesis of indandiones. IV. MARTIN FREUND AND KARL FLEISCHER. Univ. Frankfurt a/M. *Ann.* **409**, 268–90(1915); cf. *C. A.* **8**, 466.—Earlier work reported the action of substituted malonyl chlorides upon hydrocarbons. The present work is a study of the action of $Et_2C(COCl)_2$ upon phenolic ethers. 55.2 g. p-$C_6H_4(OMe)_2$ and 78.8 g. $Et_2C(COCl)_2$ in 150 cc. CS_2 were gradually treated with 110 g. $AlCl_3$ and warmed 1.5 hrs. After distn. with steam the residue was taken up in Et_2O and the soln. shaken with 10% NaOH. Upon acidifying the alk. ext., 12.8 g. *4-hydroxy-7-methoxy-2-diethylindan-1,3-dione* (*A*) pptd., brownish yellow needles from ligroin, m. 105–6°. The alk. soln. has a yellowish green fluorescence; the soln. in concd. H_2SO_4 is yellow with a green fluorescence. *Acetate*, well-formed rhomboids uniting into rosettes, m. 96–8°, sol. in concd. H_2SO_4 with deep yellow color and with a green fluorescence. The Et_2O soln. was concd. and allowed to stand 3 days, washed with a little Et_2O and filtered (soln. B). 10.5 g. *4,7-dimethoxydiethylindandione* (*B*), were obtained, yellow prisms or light yellow needles, m. 159–61°. Concd. H_2SO_4 dissolves it with a reddish yellow color and green fluorescence. A *nitro derivative*, yellow rectangular prisms, m. 81–3°, was obtained by heating with HNO_3 in a tube at 150°. The Et_2O soln. (B) gave 48.3 g. *3-diethyl-6-methoxybenzotetronic acid*, light yellow oil, b_{15} 200°, d. 1.314. Heated with HI (d. 1.7) it gives *3-diethyl-6-hydroxybenzotetronic acid*, light brown, glittering powder consisting of long pointed spears, m. 128–30°. The alk. soln. is greenish yellow, the H_2SO_4 soln. colorless. Heated with 1:1 KOH a small amt. of a substance, m. 150–50.5°, is obtained, probably *o-hydroxy-m-ethoxybenzoyldiethylacetic acid*. (*A*) heated with 1:1 KOH gives *3-hydroxy-6-methoxy-2-diethylacetylbenzoic acid*, felt-like needles, sinters 75°, m. 85° clear at 90°. The dil. aq. soln. gives a blue

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color with $FeCl_3$, changing to green. From the mother liquors of the acid a *hydrate of the acid* (?) was obtained, gray cryst. powder, m. 103°. *4,7-Dihydroxy-2-diethylindan-1,3-dione*, by the action of HI (d. 1.7) upon (*A*) or (*B*), pale yellow glistening spears, m. 90–4°. The soln. in dil. alkali has a yellowish green fluorescence, in concd. H_2SO_4 is light yellow and has a pale green fluorescence. 55.2 g. veratrole, 78.8 g. $Et_2C(COCl)_2$ in 200 cc. CS_2 and 140 g. $AlCl_3$ gave the following products: 0.8 g. *4,5-dihydroxy-2-diethylindan-1,3-dione* (*C*), long, white spears or yellowish needles, m. 116–8°. The acid or alk. soln. is yellow. 10.5 g. *5,6-dihydroxy-2-diethylindan-1,3-dione* (*D*), white spears, m. 216–8°. The acid and alk. solns. are yellow. *Acetate*, needles, m. 93–5°. 1.7 g. *5,6-dimethoxy-2-diethylindan-1,3-dione* (*E*), rectangular tables, m. 149–51°. With HI this gives (*D*). With HNO_3 in a tube, a *nitro derivative* is obtained, rhombic tables from alc., m. 104–6°. 36 g. *5-hydroxy-6-methoxy-2-diethylindan-1,3-dione* (*F*), needles, m. 106–8°. The acid and alk. solns. are yellow with a yellowish green fluorescence. The *sodium salt* is yellow, easily sol. in H_2O. (*D*), heated with concd. KOH, gives *4,5-dihydroxy-2-diethylacetylbenzoic acid*, slightly yellow, microscopic crystals, m. 177° (lactone formation) and again at 270°. The colorless concd. H_2SO_4 soln. has a bluish fluorescence. The *lactone* forms 6-sided tables, m. 269–71°. (*F*) *acetate*, prismatic columns, m. 127–9°. *3(4)-Hydroxy-4(3)-methoxy-6-diethylacetylbenzoic acid* (*G*), by heating (*F*) with KOH, grayish white tables, m. 148–9°. The aq. soln. gives a brown color with $FeCl_3$. With $PhNHNH_2$ it yields *benz-1-keto-2-phenyl-4-γ-pentyl-6(7)-hydroxy-7(6)-methoxy-2,3-diazine*, 6-sided tables, m. 148–9°. (*G*), boiled with HI, gives the *reduced lactone* of *4,5-dihydroxy-2-diethylacetyl(enol)benzoic acid*, silver-gray leaflets, m. 202–3°. *m*-$C_6H_4(OMe)_2$ reacts with $Et_2C(COCl)_2$, giving as the principal product an oil, sol. in alkalies but which becomes partly insol. in alkalies after distn. in vacuum. C. J. West.

Several pyrrole derivatives. G. Karl Almstrom. Univ. Upsala. *Ann.* **409**, 291–305(1915); cf. *C. A.* **7**, 3750.—*1,3-Diphenyl-4-benzoyl-5-methylpyrrole* (*A*), prepd. from 21.1 g. $PhCOCH_2NHPh$ and 16.2 g. $BzCH_2Ac$ by boiling in 50 cc. AcOH 5.5 hrs., S-yellow, long, pointed plates, m. 155–6°. The alc. soln., satd. with HCl, does not color a pine splinter. It does not absorb Br nor reduce $KMnO_4$. *1-Phenyl-3-p-tolyl-4-benzoyl-5-methylpyrrole* (*B*), prepd. from 4.5 g. *p*-$MeC_6H_4COCH_2NHPh$ and 3.45 g. $BzCH_2Ac$, needle-like, slightly yellow crystals, m. 138–9°. *1,3-Diphenyl-4-acetyl-5-methylpyrrole* (*C*), from 1 mol. $BzCH_2NHPh$ and 12 g. Ac_2CH_2 by boiling with 50 cc. AcOH 3 hrs., light straw-yellow, 6-sided tables, m. 104–5°. It is not changed by heating 2 hrs. with 99% $(H_2N)_2H_2O$. In abs. Et_2O, MeMgI does not cause evolution of gas. (*C*), heated with BzH and NaOH, gives *1,3-diphenyl-4-cinnamyl-5-methylpyrrole*, large ocher-yellow rectangular tables, m. 148–9°. By warming (*B*) or (*C*) with H_2SO_4 (2 parts acid and 1 H_2O) on the H_2O-bath, *1,3-diphenyl-4-methylpyrrole* is obtained, nearly white rhombic tables, m. 68–9°. *1-Phenyl-3-p-tolyl-4-acetyl-5-methylpyrrole*, from 1 g. Ac_2CO, 2 g. $PhNHCH_2COC_6H_4Me$ and 5 cc. AcOH, slightly yellow, needle-like crystals, m. 110–1°. With H_2SO_4 this yields *1-phenyl-3-p-tolyl-5-methylpyrrole*, long needles, m. 108–9°. *1,5-Dimethyl-3-phenyl-4-acetylpyrrole*, from 1 g. $BzCH_2NHMe.HBr$, 0.5 g. AcONa and 0.5 g. Ac_2CO in AcOH, yellow, 4-sided columns, m. 67–8°. Heated in alc. with BzH for 10 min. this gives *1,5-dimethyl-3-phenyl-4-cinnamylpyrrole*, fine needles, m. 107–8°. *2-Benzoyl-3,5-dimethylpyrrole*, thin rectangular tables, m. 118–9°, was obtained as a 2nd product in the prepn. of 3-phenyl-4-acetyl-5-methylpyrrole according to Knorr and Lange (*Ber.* **35**, 2004). From 10 g. Ac_2CO 1 g. was obtained. *1,3-Diphenyl-2-acetyl-4-benzoyl-5-methylpyrrole*, prepd. by boiling 1,3-diphenyl-4-benzoyl-5-methylpyrrole with Ac_2O containing a little H_2SO_4, large tables, m. 133–4°. *1,3-Diphenyl-2-cinnamyl-4-benzoyl-5-methylpyrrole*, straw-yellow needles, m. 148–50°. *1,3-Diphenyl-2,4-diacetyl-5-methylpyrrole*, from 1,3-diphenyl-5-

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methylpyrrole and Ac_2O, large, 4-sided tables, m. 85–6°. *1,3-Diphenyl-2,4-dicinnamyl-5-methylpyrrole*, light yellow needles, m. 170–1°. *1-* or *2,4-Diacetyl-3-phenyl-5-methylpyrrole*, from the 4-Ac deriv. and Ac_2O, m. 182–3°. C. J. West.

Pentoxazoles (metoxazines). S. Gabriel. Univ. Berlin. *Ann.* **409**, 305–27 (1915).—β-Aminoketones, like the α-derivs., lose 1 mol. H_2O by the action of PCl_5, forming pentoxazoles. The hexacyclic bases are far less stable than the pentacyclic oxazoles; the ring is broken open by warming the HCl salt. Attempts to isolate the free base always resulted in a rearrangement of the NH_2 base, giving an acylated β-aminoketone. **I. β-Aminopropiophenone.** *β-Benzaminopropiophenone* (*A*), prepd. by shaking 1 g. $BzCH_2CH_2NH_2$ in 10 cc. H_2O with 1.5 g. BzCl and 4 cc. 15% NaOH, long prisms, m. 94.5–5.5°. Warmed with PCl_5 this yields *2,6-diphenylpentoxazole*, sinters 84-5°, m. clear 86–7°. *Hydrochloride*, needles, m. 177–8°. Warmed with a few drops HCl *β-aminopropiophenone O-benzoate hydrochloride*, $BzOCPh:CHCH_2NH_2.HCl$, is formed, small rods, m. 184–4.5°. *Chromate*, orange-yellow. *Nitrate*, fine needles, m. 145–6°, difficultly sol. in dil. HNO_3. *Acetate*, silk-like needles, m. 121°. Attempts to prep. the free base always gave (*A*). *β-Acetaminopropiophenone*, $AcNHCH_2CH_2Bz$, prepd. by shaking 5 g. $BzCH_2CH_2NH_2.HCl$ in 25 cc. H_2O with 10 cc. Ac_2O and solid $KHCO_3$, leaflets from 2 vols. C_6H_6 and 1 vol. petr. ether, m. 76°. It is salted out from H_2O with $KHCO_3$. With PCl_5 it yields *2-methyl-6-phenylpentoxazole hydrochloride*, needles or rods from dry acetone, m. 171–2°. If the HCl salt is allowed to stand in H_2O it gradually forms *β-aminopropiophenone O-acetate hydrochloride*, pointed needles, m. 135–6°. **II. β-Aminoethyl methyl ketone.** *β-Benzaminoethyl methyl ketone*, needles, m. 81–2°. PCl_5 gives an *amide chloride*, $PhCCl_2NHCH_2CH_2Ac$, scales or needles, m. 135–6°, which upon heating under 5 mm. at 180° splits off HCl, giving *2-phenyl-6-methylpentoxazole hydrochloride*, rods, m. 148–9°. *Chloroplatinate*, yellowish leaflets. *Picrate*, short compact needles, m. 175°. Crystd. from 50% alc., this changes into the *β-aminoethyl methyl ketone O-benzoate picrate*, short prisms and plates, m. 155°. **III. Diacetoneamine.** *Benzoyldiacetoneamine*, $BzNHCMe_2CH_2Ac$, needles, m. 101°. With PCl_5 this gives *2-phenyl-4,4,6-trimethylpentoxazole*, which has the odor of bergamot oil, and decomps. upon distn. into $AcCH:CMe_2$ and PhCN. *Hydrochloride*, short prisms, m. 174°. *Chloroplatinate*, orange-yellow needles, m. 195° (decompn.). *Chloroaurate*, yellow. Heated with dil. HCl the HCl salt is transformed into *diacetoneamine O-benzoate hydrochloride*, needles, m. 169°. $Ba(NO_2)_2$ reacts with the NH_2 group, liberating about 66% of the theoretical amt. of N. Br forms the *β-bromodiacetoneamine*, isolated as the *picrate*, needles, m. 151°. *Acetyldiacetoneamine*, obtained in a slightly impure condition, b_{760} 237–45°. PCl_5 gives *2,4,4,6-tetramethylpentoxazole*, b_{764} 144°. *Picrate*, rhombic tables, m. 159°. The base is quite unstable. **IV. Salicylamine** (*o*-**hydroxybenzylamine**). *Diacetyl-o-hydroxybenzylamine*, long flat needles, m. 107°. $H_2NC_6H_4CH_2NHAc$ and PCl_5 give *2-methyl-5,6-benzmetoxazine;* better yields are obtained with P_2S_5. *Chloroaurate*, flat, golden yellow needles, m. 134–5°. *Chloroplatinate*, brownish yellow needles, m. 207–9° (decompn.). *Picrate*, leaflets, m. 187°. The same base may be obtained from the di-Ac compd. **V. Behavior of several aminoalkyl benzoates.** $BzOCH_2CH_2NH_2.HBr$, warmed with an equimol. amt. of *N*-NaOH, gives $BzNHCH_2CH_2OH$, m. 64° (Knorr, 58°). $BzOCH_2CHMeNH_2$ behaves similarly. $BzOCH_2CH_2CH_2NH_2.HBr$ gives *γ-hydroxypropylbenzamide*, needles, m. 60–5°. C. J. W.

Influence of the constitution upon the rotation of optically active substances. VIII. H. Rupe. Univ. Basel. *Ann.* **409**, 327–57(1915); cf. *C. A.* **8**, 3736.—A new series of alkyl and aryl derivs. of methylene-camphor has been optically investigated. The previously stated law concerning the influence of certain groups upon the rotation has been further confirmed. A comparison of the rotation dispersion of the compds. of the series of methylene-camphor, several hydrocarbons derived from citronellal, and

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a number of esters of menthol and myrtenol has shown that $[\alpha]_F - [\alpha]_C$ is a const. for homologous series or for substances which belong to the same class of compds. This const. may be considered as a function of the wave length, using a formula of Hagenbach's, and one obtains in this way the "characteristic wave length" for the particular series. The characteristic wave length proves of practical value in criticizing the rotation dispersion curve. Using the characteristic wave length the notion of the "relative anomalous rotation dispersion" has been developed, those in which the sp. rotation increases with increasing refrangibility but which have a considerably displaced characteristic wave length. C. J. WEST.

Action of ozone upon organic compounds. IV. C. HARRIES. *Ann.* **410**, 1–21 (1915); cf. *C. A.* **6**, 2754.—**Ozonides of pinene and cyclohexene.** With RICHARD SEITZ. *Ibid* 21–8.—If the O_3 is washed with 5% NaOH and concd. H_2SO_4, pinene gives an *ozonide*, $C_{10}H_{16}O_3$, white solid, insol. in Et_2O. Besides this a sirupy ozonide, sol. in ether and insol. in hexane, and a residue, sol. in hexane, were obtained. The amt. of solid ozonide formed increases with decreasing temp. At 12°, 0.3% is formed, at 0°, 3.5%, while at —20°, 18.5% is formed. 100 g. pinene gave 19.2 g. of a sirupy ozonide, b. 60–90°. Since this product decolorized Br, it did not seem possible to obtain a pure normal monomol. ozonide by further distn. *Monomol. cyclohexene ozonide*, prepd. by treating cyclohexene in hexane with washed 6–9% O_3, and concg. the hexane mother liquors, mobile, highly refractive liquid, b_{10} 47–52°, b_{18} 59–59.5°, easily sol. in warm H_2O with partial decompn.; the soln. reduces Fehling soln. and contains H_2O_2. The *solid polymeric ozonide* is obtained if cyclohexene is ozonized in dil. solns. (5 parts in 100 parts hexane) with washed 9% O_3, or with unwashed strong O_3-mixts., even in the presence of traces of HCl. The ozonide is insol. in Et_2O, m. 60–65°, explodes 140–50°. In $CHCl_3$ an ozonide is obtained which contains a mixt. of $C_6H_{10}O_3$ and $C_6H_{10}O_4$. The rate of decompn. is shown by the following: 6.2 g. ozonide in 95 cc. H_2O at 120° contained 3.85 g. ozonide after 0.5 hr., 1.43 g. after 1 hr., 0.52 g. after 1.5 hrs., 0.25 g. after 2 hrs. and 0.1 g. after 2.5 hrs. The decompn. products isolated were: cyclopentenealdehyde, adipic dialdehyde, and adipic acid. The pure *adipic dialdehyde* has d_4^{19} 1.003, n_D^{19} 1.43067, n_α 1.42861, n_γ 1.44097, $M_\alpha - M_\gamma$ 0.74, calcd. dialdo form, 0.76. Thus adipic dialdehyde is a truer dialdehyde than is succinic dialdehyde. **Ozonide of cyclopentene.** With HANS WAGNER. *Ibid* 29–40.—The normal ozonide of cyclopentene explodes violently when heated to 50–55°. When treated with 5% O_3 in EtCl at the temp. of CO_2-Et_2O mixt., a *solid, polymeric ozonide* is formed, which becomes cryst. by treating the residue of the expt. with Et_2O; it explodes at 94°, insol. in ordinary org. solvents, is decompd. by NaOH, giving a brown color, reacts violently with concd. H_2SO_4, forms H_2O_2 when treated with H_2O. If the normal ozonide is allowed to stand in bright sunlight for 2 hrs., and the product digested with Et_2O, a solid, microcryst. ozonide is obtained, which is not explosive. High % unwashed O_3 acting upon cyclopentene in CCl_4 gives the normal ozonide. In $CHCl_3$ a mixt. of 2 parts of solid and 1 part normal oxozonide results. The *solid oxozonide*, snow-white microcryst. mass, is insol. in the ordinary org. solvents, reacts violently with concd. H_2SO_4 but is not decompd. by NaOH. It is very explosive when heated. It is more readily decompd. by H_2O than the solid ozonide. Since the aq. soln. only slightly reduces $HgCl_2$, it is probable that the decompn. products are largely acid in character. The *monomol. oxozonide* is a yellow, mobile liquid with a very penetrating odor, sol. in $CHCl_3$ and AcOEt, insol. in petr. ether. Upon standing it changes to a sirupy consistency and finally forms a glassy mass. It is explosive. In vacuum it gradually gives up 1 atom O, forming the normal ozonide. In the reduction of cyclopentanone better yields are obtained by the use of abs. than with ordinary Et_2O. The alc. in the latter (as EtONa) acts as a condensing agent upon the ketone. *Benzal derivative of α-cyclopentylcyclo-*

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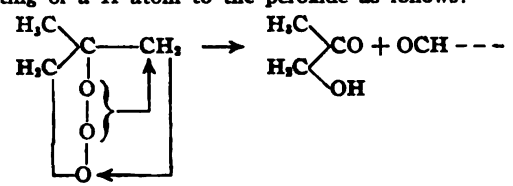
pentanone, by shaking 10 g. ketone, 7 g. BzH, 200 cc. 10% NaOH and 10 cc. alc. 12 hrs., fine, slightly yellow needles, m. 97–8°. It decolorizes Br in AcOH. *α-Cyclopentylcyclopentene*, prepd. by warming 25 g. pentanol with 50 g. $KHSO_4$ at 180–190° for 1 hr., b_{17} 82–3°, b_{13} 79°, $d_4^{22.5}$ 0.8953, $n_D^{22.5}$ 1.48627, n_α 1.48284, n_γ 1.49979, M_γ—M_α 1.29. With washed O_3 in petr. ether, a mixt. of the ozonide and the oxozonide is formed, thick, golden yellow liquid, which becomes brown upon standing in a vacuum. **Concerning the constitution of citronellal.** With Friedrich Comberg. *Ibid* 40–54.—The ozonide of the dimethylacetal deriv. is obtained by the action of washed O_3 in hexane at low temp. It was decompd. by boiling with H_2O for 2 hrs. and sepd. into H_2O-sol. and insol. products. The H_2O-insol. part was taken up in Et_2O and neutralized with $CaCO_3$, and the salts shaken out with H_2O. The Et_2O soln. contained $Me_2C{:}O_3{:}CMe_2$; probably the *condensed dialdehyde of β-methyladipic acid* (*methylcyclopenteneraldehyde*), isolated as the *semicarbazone*, m. 181°; *5-methylcyclopentene-1-carboxylic acid* (*?*), b_{13} 130°, analyzed as the *silver salt;* the higher boiling fraction probably contains *methyloctanonal peroxide*, $MeC{:}O_2.CH_2CH_2CH_2CHMeCH_2CHO$, yellow oil, b_{14} about 100°. This was decompd. by boiling with 10% NaOH and the aldehydes and ketones isolated by extn. with Et_2O. $MeCH.CH_2.CH_2.CAc{:}CH.CH_2$ was isolated from the Et_2O ext. The acid fraction contained β-methyladipic acid and its half aldehyde. The original H_2O-sol. portion contained HCO_2H, acetol, β-methyladipic acid and its half aldehyde. The semicarbazone, ozonized in either AcOH or CCl_4, gave an oxozonide, amorphous yellow mass. Upon decompn. this yields *methyloctanonal*, isolated as the *semicarbazone*, yellow needles, m. 185°; traces of HCO_2H and the *half aldehyde of γ-methyladipic acid*, isolated as the *semicarbazone*, m. 120–5°. These facts make it seem possible that the action of O_3 may cause a shifting of the double bond. Thus, while part of the above decompn. products must result from citronellal with the formula $CH_2{:}CMe(CH_2)_2CHMeCH_2CHO$, the remainder are derived from rhodinal, $Me_2C{:}CH(CH_2)_2CHMeCH_2CHO$. In the case of the dimethylacetal the proportion of citronellal to rhodinal is about 2 to 3; in the case of the semicarbazone, these figures are reversed. It is not excluded, however, that citronellal contains an impurity which is extremely difficult to remove. The above work also involves a new reaction in the decompn. of ozonides, in that a keto-alc. has been found among the decompn. products. This may be explained by assuming a peroxide decompn. with simultaneous shifting of a H atom to the peroxide as follows:



Constitution of dimethylpiperidine and piperylene. Friedrich Düvel. *Ibid* 54–70.—18 g. $(CH_2)_3Br_2$ and 45 g. 33% Me_2N in abs. alc. were warmed in a sealed tube 24 hrs. at 80°, and yielded 26 g. *bis-quaternary ammonium bromide*, thin rods, does not m. 300°. Recrystd. from alc., a small amt. of the *unsaturated quaternary ammonium bromide*, $CH_2{:}CH(CH_2)_2CH_2NMe_2Br$, is formed, compact prisms. When the free *bis-quaternary ammonium base* is liberated with Ag_2O and dry distd., *dimethylpiperidine* (*dimethylamino-4-pentene*) is obtained, b. 118°, $d_4^{17.5}$ 0.7548, $n_D^{17.5}$ 1.42017, n_α 1.41706, n_γ 1.43174. *Oxalate*, $Me_2N(CH_2)_2CH{:}CH_2(CO_2H)_2$, flat rods, m. 122°. A sample prepd. from Hofmann's base had the same properties. In the above reaction a small amt. of piperylene is formed, b. 42–4°, $d_4^{16.5}$ 0.6957, $n_D^{16.5}$ 1.44020, n_α 1.43264, n_γ 1.46009. The diozonide is very explosive so that no definite information could be

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obtained regarding the constitution. The fact that O_3 is taken up very slowly points to the presence of a conjugated double bond, already suggested by Thiele. Dimethylpiperidine was ozonized in dil. HCl soln. and the ozonide decompd. by warming to 50°. HCHO was given off during the decompn. The aq. soln. gave *α-dimethylaminobutyric acid hydrochloride*, needles, m. 146°; *chloroplatinate*, yellow-brown, irregular rods, m. 170° (decompn.); and *α-dimethylaminobutyraldehyde*, which apparently condenses on distn. in vacuum. The substance $C_{12}H_{24}ON_{20}$ (2 mols. aldehyde–1 H_2O) was isolated as a yellow, strongly alk. oil, b_{11} 142°. The monomol. form was obtained in the form of the *diethylacetal*, b_{11} 94–5°, $d_4^{20.5}$ 0.8662, $n_D^{20.5}$ 1.42267. *Acid oxalate*, leaflets, m. 118°. *Picrate*, yellow rods or prisms, m. 113–4°. *Methiodide*, powder, sinters 40°, m. 50°. Upon dry distn. this yields crotonacetal (Wohl and Frank, *Ber.* **35**, 1904). These facts establish the constitution of dimethylpiperidine as $Me_2{:}CH(CH_2)_3NMe_2$. The double bond is quite stable, not being shifted by boiling with Na and $C_5H_{11}OH$ for 24 hrs. **Dihydrocarvylamine, dihydroterpenylamine and carvylamine.** With George Francis Morrell. *Ibid* 70–82; cf. *C. A.* 5, 3822.—1-Methyl-2-benzoylamino-4-acetylcyclohexane is stable when heated with AcOH or concd. HCl in a sealed tube at 120°. *p-Nitrophenylhydrazone*, fine yellow needles, m. 252°. *Semicarbazone*, microscopic needles, m. 200°. Oxidation of α-benzoyldihydroterpenylamine with O_3 gives *cis-2-benzoylamino-1-methyl-4-cyclohexanone*, small needles, m. 184–5°. *Nitrophenylhydrazone*, m. 248° (decompn.). *Semicarbazone*, needles, m. 194° (not entirely pure). *Trans derivative*, needles, m. 150–1°, obtained from the β-Bz deriv. Dihydroterpenylamine phosphate, when dry distd., gave a yellow oil, b_{12} 60–8°, which consists of a part (terpin) yielding a nitrosite m. 155–6° and a second part (terpene, menthadiene?), b_{14} 63–5°, d_{19}^{19} 0.8466, n_D^{19} 1.49013, n_α 1.48621, n_γ 1.50845. Carvylamine (Goldschmidt, *Ber.* **20**, 486; **30**, 2069) was obtained in 80% yield by reducing 20 g. carvone oxime in a mixt. of 160 cc. each of AcOH and abs. alc. with 60 g. Zn dust at 0°, $b_{12.5}$ 94–5°, d_{19}^{19} 0.9168, $[\alpha]_D^{19}$ 105.8°, M_D 159.8, n_D^{19} 1.49820, n_α 1.49474, n_γ 1.51369. Hydrochloride, powder, sinters 215°, m. 220° (G. gives 180°). Bz deriv., fine needles, m. 174° (G., 169°). *Dihydrochloride*, obtained by passing HCl gas into carvylamine in Et_2O for 2 hrs., cryst., m. 145°. NaOH gives the Cl-containing base; the Bz deriv. was not solid and was not investigated. Heated with $C_5H_{11}N$ for 3 hrs. at 100° a mixt. of 3 or 4 isomeric substances (terpenylamine and carvylamine) is formed. **1-Methyl-2-amino-4-ethanoylcyclohexane.** With Sidney Smith. *Ibid* 82–94.—*1-Methyl-2-acetylamino-4-ethanoylcyclohexane*, prepd. by oxidizing acetyldihydrocarvylamine in AcOH with 10–12% unwashed O_3 for 4 hrs., fine, silk-like needles, m. 193–4°. It is not changed by heating 3 hrs. with concd. HCl in a sealed tube at 120°. *Semicarbazone*, m. 234–5° (decompn.). *p-Nitrophenylhydrazone*, light yellow, m. 229° (decompn.). *Oxime*, decomps. 221°. Anhydrous HCO_2H and dihydrocarvylamine give *formyldihydroterpenylamine(?)*, fine needles, m. 152–3°. *Formyldihydrocarvylamine* is obtained when HCO_2Et is used, b_{15} 179–80°, d_{16}^{16} 0.9934. With O_3 it yields *1-methyl-2-formylamino-4-ethanoylcyclohexane*, prisms, m. 120–1°. *Oxime*, fine, silk-like needles, m. 179°. *p-Nitrophenylhydrazone*, fine, yellow needles, m. 239° (decompn.). *Semicarbazone*, m. 201° (decompn.). The formyl deriv. is sapond. by warming with concd. HCl at 100°. *Oxalyldihydrocarvylamine*, $(C_{10}H_{17}NHCO—)_2$, fine needles, m. 250°. *Semioxalyldihydrocarvylamine*, needles, m. 94°. Oxidized with O_3 this yields *1-methyl-2-[semioxalylamino]-4-ethanoylcyclohexane*, needles, m. 107°. This is easily sapond. on the H_2O bath. *Oxime*, fine needles, m. 140° (decompn.). *p-Nitrophenylhydrazone*, yellow needles, m. 218–9° (decompn.). *Semicarbazone*, m. 168°. *Carbethoxydihydrocarvylamine*, prepd. by adding 74 g. dry K_2CO_3 to a soln. of 80 g. amine in 500 cc. Et_2O and dropping in 56 g. $ClCO_2Et$, white needles, m. 88°. *1-Methyl-2-carbethoxyamino-4-ethanoylcyclohexane*, white needles, m. 127°. *p-Nitrophenylhydrazone*, yellow needles, m. 200°. *Semicarbazone*, m. 181°. *Oxime*, fine needles, m. 144–5°. Heated with

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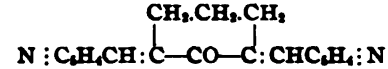
concd. HCl in a sealed tube at 105°, *1-methyl-2-amino-4-ethanoylcyclohexane* is formed, b_{11} 65–8°, m. 119–22°. *Hydrochloride*, needles, m. 183–5°. Oxime, needles, m. 151°. *Benzoyl derivative*, m. 218° (identical with the oxidation product from benzoyldihydrocarvylamine). The solid product does not give a Bz deriv. and so is probably a polymerization product. **Aldehydes of the pyridine and piperidine series.** GEORG H. LÉNÁRT. *Ibid* 95–116; cf. *C. A.* **8**, 1774.—α-Pyridylaldehyde b_{13-14} 62–3°, b_{16-17} 70–1°, b_{760} 181°, $n_D^{18.5}$ 1.53–886, n_α 1.53284, $n\beta$ 1.55396, n^7 1.56749. 20 g. stilbazole, treated with O_3, gave 1.9 g. BzOH, 5.9 g. BzH, 2.1 g. pyridylaldehyde, 6.3 g. picolinic acid, and 2.6 g. residue. A part of this residue consists of a *hydrochloride* of the *compound*, $PhCH_2CHClC_5H_4N$ or $PhCHClCH_2C_5H_4N$, yellow prisms, m. 153–4°. *Pyridylaldehyde hydrochloride*, by evapg. a soln. in HCl in vacuum and extg. with acetone, prismatic needles, m. 103–7°; it contains 1 mol. H_2O. *Picrate*, yellow needles, grouping into stars, m. 101–2°. With $NaHSO_3$ fine, glistening needles are obtained which are probably the *acid sulfurous acid salt*, sublimes 160°. With NH_3 it gives the *compound*, $(N:C_5H_4CH:NH)_3$, citron-yellow, compact prisms, decompd. into its components by boiling with H_2O or alc. Pptd. from $CHCl_3$ with Et_2O, fine, slightly yellow needles are obtained m. 126° (decompn.). *α-Pyridaldazine*, $(N:C_5H_4CH:N:)_2$, yellow, glistening needles or prisms from alc., m. 149°. It decolorizes Br. *α-Pyridalaniline*, $NC_5H_4CH:NPh$, prepd. by heating mol. amts. of the components at 150° for 15 min., pale green oil, b_{12} 165°. *Dibromide*, fine needles. *Pyridyl-α-methanal-p-nitrophenylhydrazone*, best prepd. in HCl soln., yellow powder, m. 235°. The alc. or acetone soln. gives a deep violet-red color upon addition of a trace of alkali. Concd. H_2SO_4 gives a brick-red color, which is not deepened by adding $FeCl_3$. *Hydrochloride*, fine, reddish yellow needles from alc., sinters 260°, m. 277° (strong decompn.). *Methiodide*, by heating the components 12 hrs. in a sealed tube at 95°, colorless liquid. *Phenylhydrazone*, orange yellow needles, with 2 mols. H_2O; anhydrous, m. 239–40°. *Diethylacetal*, $N:C_5H_4CH(OEt)_2$, b_{14} 110–2°. Upon reduction with Na and abs. alc., this yields *piperidylaldehyde diethylacetal*, b_{14} 95–100°. Sapond. with HCl and treated with *p*-$O_2NC_6H_4NHNH_2$, *piperidylaldehyde p-nitrophenylhydrazone hydrochloride* is obtained, brick-red ppt., m. 228° (decompn.). *α-Pyridylcarbinol*, by the action of 50% KOH upon the aldehyde, b_{16-7} 112–3°. *Picrate*, golden yellow, m. 159°. *Chloroplatinate*, fine red-yellow needles, m. 179° (decompn.). *α-Pyridoin* (*α-pyridoylpyridylcarbinol*), $C_5H_4NCH(OH)COC_5H_4N$, by the action of 0.2 g. KCN upon 2.2 g. C_5H_4NCHO in 10 cc. H_2O, fine, yellow needles from alc., m. 156°. Dil. HCl gives a yellow, AcOH a red soln. It reduces Fehling soln. With HNO_3 this gives *α-pyridyl* (*2,2-dipyridylglyoxal*), citron-yellow rhomboids, m. 154–5°. *α,α-Dipyridylethylene* (*pyridostilbene*), $(C_5H_4NCH:)_2$, prepd. by heating 2 g. C_5H_4NCHO with 3 g. C_5H_4NMe and 2 g. $ZnCl_2$ 24 hrs. at 200°, b_{17} 200°, needles, m. 118–9°. With Br in AcOH this yields a *symmetrical dibromide*, small prisms, m. 153–4°. *p,p-Tetramethyldiaminodiphenyl-α-pyridylmethane*, obtained by warming 1 part C_5H_4NCHO with 2.5 parts $PhNMe_2$ and 2 parts $ZnCl_2$ at 100°, and removing the $PhNMe_2$ with steam, fine leaflets from alc., m. 110°. Oxidized with PbO_2 in HCl soln., it yields the *carbinol*, isolated as the *zinc chloride double salt*, metallic glistening ppt. This has a bluish tint as compared with a yellow tint for malachite green. Condensed with cyclohexanone, 2 *compounds* are obtained: white needles, m. 193°, probably (I), and long, yellow needles, m. 127°, probably (II).



(I)

(II)

β-Pyridylaldehyde was obtained by the oxidation of benzoylmetanicotine ($C_5H_4NCH:CHCH_2CH_2NMeBz$), b_{15} 95–7°, has a quinoline-like odor, easily sol. in H_2O and org. solvents and behaves very similarly to the α-aldehyde. *Phenylhydrazone*, pale yellow

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leaflets, m. 158°. Concd. H_2SO_4 gives a purple-red soln., changing to a dirty green upon addition of $FeCl_3$. Attempts to prep. the α-aldehyde by dry distn. of $(HCO_2)_2Ca$ and $Ca(O_2CC_4H_4N)_2$ failed; a thick oil, b_{12} 145°, was obtained but no definite product isolated. C. J. West.

Bicyclic quinones. III. Dianthryl. Alfred Eckert and Alice Hofmann. Univ. Prag. *Monatsh.* 36, 497–505(1915).—Dianthryl (*A*) is best prepd. by boiling 40 g. $C_6H_4(CO)_2C_6H_4$, 200 cc. glacial AcOH, 80 g. Sn and 2–3 drops of very dil. $PtCl_4$ and gradually adding (during 0.5 hr.) 100 cc. concd. HCl in portions of 10 cc. and then boiling 1 hr. Oxidized by gradually adding (1 hr.) 2.6 g. finely pulverized PbO_2 to 7 g. (*A*) suspended in 200 cc. AcOH at 60–70° it yields dianthranyl acetate (*B*), m. 284°. (*B*), sapond. with concd. H_2SO_4, is simultaneously oxidized to dianthrone. The product is not pure because the oxidation proceeds further. Sapond. with alkalies (*B*) gives dianthranol (*C*). Two g. (*C*), 50 cc. AcOH, 5 g. Sn and a trace of $PtCl_4$, heated to boiling and treated with 25 cc. concd. HCl during 2 hrs., gave dianthryl. *Dihydrodianthrone*, reduced in the same way, gave *10,10'-dihydroxytetrahydrodianthryl*, $C_{28}H_{22}O_2$ (*E*), yellow needles from petr. ether, m. 150–3°. Sublimed or recrystd. from Ac_2O or boiled with EtOH or AcOH, it loses H_2O, forming (*A*). Anthrapinacol, oxidized with $(NH_4)_2S_2O_8$ in AcOH, yields $C_6H_4(CO)_2C_6H_4$. (*E*), with the same treatment, gives dihydrodianthrone. C. J. West.

Theory of reactions in steps, especially those in the preparation and saponification of esters of dicarboxylic acids. Rud. Wegscheider. Univ. Vienna. *Monatsh.* 36, 471–95(1915).—Mathematical formulas are developed for two-phase reactions under various conditions. C. J. West.

Ethyl hydrogen phthalate. Walter v. Amann. Univ. Vienna. *Monatsh.* 36, 505–8(1915).—*Ethyl hydrogen phthalate*, prepd. by boiling technical $C_6H_4(CO)_2O$ with abs. alc. with careful exclusion of H_2O, solidifies after standing *in vacuo* at 0°. Recrystd. from CS_2 it forms monoclinic crystals, m. 47–8°, *a:b:c* = 0.6425:1:0.5197, *ac* = 91° 2', (100), (010), (110), (021), (111). The ester is readily sapond. by alkalies. C. J. West.

The double bond in the cholesterol molecule. Otto von Fürth and Gustav Felsenreich. *Biochem. Z.* 69, 416–47(1915).—In order to test thoroughly the possibility of a "masked" double bond in cholesterol, a study was made of the addition of H, halogens and O_2. Using cholesterol and cholestene and the most favorable conditions for hydrogenation, it was not possible to produce any change beyond that of a $CH:CH_2$ group to an Et group. Dihydrocholesterol has $[\alpha]_D$ 23.46°, and gives the Liebermann-Burchhardt reaction (also cholestane) under definite conditions, though the color is much less intense. Thus this test does not depend upon a double bond, though the color is increased by its presence. Dihydrocholesterol is capable of adding Br, taking up almost as much as cholesterol. In an attempt to isolate the reaction product, only unchanged dihydrocholesterol was obtained. Thus the reaction probably gave an easily dissociable compd. but there was no satn. of a true double bond. In the expts. with O_2, all three compds. took up about the same amt. Cholesterol took up 1.5 to 4 mols., dihydrocholesterol, 1.5 to 4.8 mols. and cholestane 1.5 to 4.8 mols. O_2, depending upon the time of reaction. Thus it is evident that continued action of O_2 produces a breaking down of the mol. The existence of a 2nd double bond in the cholesterol mol. is not established. It appears possible that there are 4 ring systems in the mol. C. J. West.

Behavior toward Fehling solution of organic compounds containing carbon, hydrogen and oxygen. B. M. Margosches. Brünn. *Biochem. Z.* 70, 252–61(1915).—A general review of the behavior of aldehydes, ketones and acids towards Fehling soln. C. J. West.

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Gall pigments. VIII. Bilirubin. WILLIAM KÜSTER with H. BAUER, K. REIHLING AND A. SCHWADERER. Stuttgart. *Z. physiol. Chem.* **94**, 136–62(1915).—The recrystn. of crude or pure bilirubin from $PhNMe_2$ gives a yield of about 65%. The remainder is probably decompd., as a brown *compound*, needles forming into rosettes, m. 134–6°, can be isolated. The amt. does not seem to be increased by long boiling of the $PhNMe_2$ soln. Treated with Me_2SO_4 in MeOH-NaOH an amorphous di-Me deriv. is formed. If an aq. soln. is used a different product is obtained, containing less Me. Bilirubin may be esterified in MeOH-HCl at room temp., but even in an atm. of H, a green product is obtained, which is probably a deriv. of a changed bilirubin. HCl, passed into a $CHCl_3$ soln. of bilirubin, gives an addition product, $(C_{33}H_{36}O_6N_4)_2.3HCl$, red-violet powder, which gives a soln. with a green fluorescence; it is decompd. by $AgNO_3$ or alkalies but not by H_2O. If the $CHCl_3$ soln. is warmed a product is obtained with about half the HCl content; in this case the halogen is slowly given up to C_5H_5N. Bilirubin, boiled a short time with AcOH, gives a green soln., which becomes turbid upon addition of H_2O. AcOEt gives a light yellow soln. $ClCH_2CO_2H$ gives a dark green soln., from which H_2O ppts. a compd. Its ester gives an orange-red soln. Cl_3CCO_2H gives a bluish green soln., from which H_2O ppts. a dark blue substance. The ester gives a brownish red soln. HCO_2H does not seem to change it. *Ammonium bilirubinate* is obtained as brownish red needles by suspending 10 g. bilirubin in 75 cc. MeOH and passing in NH_3 gas until soln. results. It gradually loses its NH_3. It is sol. in $NaHCO_3$. Boiled with $CHCl_3$ it loses NH_3, giving a light colored bilirubin. The mother liquor gave a little unchanged bilirubin, and a product that resembles bilinigrin. CH_2N_2 reacts with the NH_4 compd. in $CHCl_3$, giving a light brownish yellow ppt., which darkens at 115° and then gradually decomps. The substance probably contains 3 Me groups. Bilirubin gives deep red salts with $SnCl_4$ and $AlCl_3$; in the decompn. of the double compound the bilirubin is also decompd. 5 g. bilirubin, added to 100 g. AcOH-HBr during 5 days, the soln. concd., and warmed with 100 cc. MeOH, gave a blue-violet *compound*, containing 13.87% Br and 3.56% Me, sol. in concd. H_2SO_4 with a deep blue color; it gives a positive reaction with diazotized $C_6H_4(NH_2)SO_3H$. The soln. in $CHCl_3$ does not give up the substance to 12.5% HCl, slightly to 25%, while 37% HCl forms an emulsion, and after the addition of H_2O the substance remains in the HCl layer. When again treated with MeOH it loses Br and Me, and analyzes very well for $C_{32}H_{41}O_7N_4Br$. CH_2N_2 gives an amorphous red product, which appears to be a di-Me deriv. containing 1 CH_2N_2. **IX. The formation of gall stones.** With K. REIHLING. *Ibid* 163–71.—The portion of gall stones sol. in alc., was sepd. into 4 fractions: A, seps. on cooling, and further sepd. into A_1 and A_2, sol. and insol. in alc. A_1 contains 63.35, 6.17, 8.54%; A_2, 58.84, 6.67, 8.84% C, H, N, resp. B is obtained by pptg. the alc. mother liquors with Et_2O, black amorphous mass. The Et_2O is removed and petr. ether added, giving a ppt. C, brownish resin, gives the pyrrole reaction when distd. with Zn, contains 65.6, 9.01, 3.08% C, H, N. The principal part remains after distg. off the alc., brownish mass, sol. in AcOH and NaOH. Upon oxidation with H_2SO_4-CrO_3 it yields hematinic acid. Choleprasin was hydrolyzed by heating with 250 cc. concd. HCl 7 hrs. on the H_2O bath, filtering and repeating twice, then concentrating to a sirup and heating with concd. HCl 12 hrs. at 170–80°. The only crystn. product isolated was histidine. The undissolved part resembled bilihumin. Upon oxidation with HNO_3 a *compound*, yellow, N-free needles, m. 57°, was obtained which upon sapon. gave an *alcohol*, m. 51.5°, and an *acid*, m. 40°. Oxalic and hematinic acids were also isolated. C. J. WEST.

Hematoporphyrin. IV. WILLIAM KÜSTER AND HUGO BAUER. Stuttgart. *Z. physiol. Chem.* **94**, 172–90(1915).—Upon repeating the effect of Me_2CO upon hematoporphyrin (Willstätter, *C. A.* **8**, 89), analyses were obtained which indicated at least

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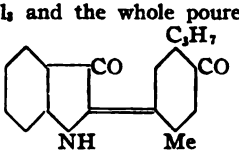
a partial splitting off of H_2O. By modifying the method of Deihle and Küster (*C. A.* 8, 86) so that 10% HBr is used for sapong. the tetra-Me compd. instead of HCl, the same cryst. ester is obtained as was found by W. This ester takes up 2 mols. NH_3. The Ag salt prepd. from this contains 3 atoms Ag. The earlier prepd., amorphous ester and the cryst. ester both give the same tetra-Me ester when treated with CH_2N_2. The m. p. is dependent upon the rate of heating, 158° being often observed (W. gives 163°). *Dimethyl ester of dimethoxyhemin*, $C_{38}H_{44}O_8N_4FeBr$, is found in the Et_2O soln. of the di-Me ester; the Et_2O soln. is brownish yellow, changing to brown-red when shaken with HCl. Upon oxidation with CrO_3 in 20% H_2SO_4, the di-Me ester gave nearly 2 mols. hematinic acid, and a *methoxy imide*, $C_8H_{11}O_3N$, m. 59°. Sapond., the acid gave a *silver salt*, $C_8H_{10}Ag_2O_8$, colorless needles. α- and β-Dimethyl (bromo)hemin both give off more or less of the Fe when heated with 10% HCl at 130° without porphyrin formation. At 150° porphyrin formation takes place. C. J. West.

Preparation of urine indican. Erw. Schwenk and Ad. Jolles. *Biochem. Z.* 69, 467–70(1915); cf. *C. A.* 9, 1308.—By certain changes in the method the yield of indican has been raised to 76%. It seems necessary to let the suspension of 15 g. chlorosulfonic acid in 50–60 g. C_5H_5N and the C_5H_5N soln. of 5 g. of N-acetindoxyl stand 2 hrs. at 38°, then 40 hrs. at room temp. It is completely purified by short extn. with a small amt. of boiling H_2O, which removed the KCl, and then crystn. from 96% alc. C. J. West.

New indoxyl derivative. Adolf Jolles. Vienna. *Monatsh.* 36, 457–70; cf. *Z. physiol. Chem.* 94, 79–103(1915); *C. A.* 9, 1308.—Indoxyl, obtained by heating technical indoxylic acid, yields 2 compds. when treated with AcOH, thymol and $FeCl_3$; a blue amorphous *compound* (*A*), difficultly sol. in $PhNO_2$, formed from an impurity in the acid, and a red cryst. compd. (*B*), easily sol. in $PhNO_2$. If the acid (30 g.) is first extd. with boiling H_2O, in which the impurity is insol., and AcOH added to the filtrate until the indoxyl goes into soln., then 25 g. thymol in AcOH added, the mixt. poured into a soln. of 110 g. $FeCl_3$ and the whole poured into concd. Na_2CO_3, only (*B*), *4-thymol-2-indolindolignone*,



is formed, red prisms and needles, m. 218–20° (decompn.). The red to brown-red solns. are changed to violet by adding HCl. The original color is obtained by neutralization or by washing the HCl out with H_2O. Heated with 10% NaOH it is decompd. into *o*-$H_2NC_6H_4$-CO_2H and 1,2,4,5-$C_6H_2(C_3H_7)(OH)MeCHO$. *Hydrochloride*, by passing dry HCl into (*B*), in Et_2O, brownish black needles. By means of the violet color which (*B*) gives with HCl, 0.0032 mg. indican in 10 cc. H_2O can be detected, which is 4 times as sensitive as the Obermayer test. The same reaction may be used as a quant. estimation of indican, proceeding as follows: 10 cc. of dil. indican are mixed with 1 cc. 5% thymol in a dropping funnel, 10 cc. concd. HCl (containing 5 g. $FeCl_3$ per l.) are added, the mixt. shaken and allowed to stand 2 hrs. This is then extd. with $CHCl_3$ until the ext. is colorless; the ext. is shaken with H_2O and then with dil. (0.02–0.001 *N*) NaOH and then compared with a standard (0.01 g. indican in 10 cc. $CHCl_3$ and 5 cc. dild. to 50 cc.). C. J. West.

New indican reactions. Adolf Jolles. Vienna. *Z. physiol. Chem.* 95, 29–33 (1915); cf. *C. A.* 8, 722 and preceding abstr.—α-Naphthol is found to react in the same way as thymol. 30 g. indoxylic acid are extd. with H_2O, the indoxyl brought into soln. by addition of AcOH, 24.5 g. α-naphthol in AcOH added and the mixt. poured into an excess HCl-$FeCl_3$ (110 g. $FeCl_3$ in 300 cc. concd. HCl). The 2 isomers are

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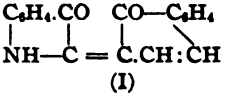
sepd. by Na_2CO_3. The Na_2CO_3-sol. part is *4-naphthalene-2-indolindolignone* (I), red-brown crystals. The insol. part is *2-naphthalene-2-indolindigo* (II). Decompd.



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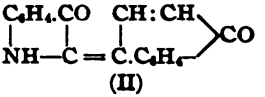

(II)

with alkali this yields *o*-$H_2NC_6H_6CO_2H$ and 1,2-$C_{10}H_6(OH)CHO$. A dye was also obtained with 1,2-$C_{10}H_6(OH)SO_2H$ but it is too sol. in H_2O to be useful for purposes of isolation. G. M. MEYER.

Urinporphyrin. I. HANS FISCHER. Univ. München. *Z. physiol. Chem.* **95**, 34–60(1915).—The filtered urine from a case of hematoporphyrinuria was treated with an excess of AcOH (a l. needs about 12.5 cc.); the urinoporphyrine settles out overnight. It was purified by dissolving in dil. NaOH and pptg. with AcOH. The yield from 25 l. is 6 g. dry material. *Methyl ester*, $C_{42}H_{56}N_4O_{16}$, prepd. by the action of MeOH-HCl upon urinoporphyrin, and crystd. out of $CHCl_3$-MeOH, concentric needles, m. 290° (decompn.). *Ethyl ester*, $C_{44}H_{70}N_4O_{16}$, m. 220°, gives a deep red, fluorescent soln. It is optically inactive. Upon sapon. of the ester with acid or alkalies, the free porphyrin was obtained cryst. from C_5H_5N-EtOH, but it contained 0.5 mol. C_5H_5N. By carefully neutralizing a soln. in $NaHCO_3$ with AcOH, fine, microscopic needles were obtained, $C_{41}H_{42}N_4O_{16}$. These formulas indicate the presence of 7 CO_2H groups. No evidence as to the presence of glucuronic acid or other sugar radical could be obtained. *Methyl ester copper salt*, from the ester and $Cu(OAc)_2$ in AcOH, felt-like, light red needles. *Iron salt*, $C_{48}H_{54}N_4O_{16}FeCl$, compact prisms, sinters 238°, decomp. 280°. Reduced with AcOH-HI, phonopyrrolecarboxylic acid was isolated as the picrate. No basic fraction was found. This may be due to the presence of hydroxypyrroles. G. M. MEYER.

Heneicosoic acid. HENRY R. LE SUEUR AND JOHN C. WITHERS. London. *J. Chem. Soc.* **107**, 736–9(1915).—A prepn. of the normal C_{21} acid, the only one up to C_{22} as yet unknown. After immersion in a 1.25% soln. of $HgCl_2$ for 1 hr., 50 g. granulated Zn were added to 5 g. μ-ketoheneicosoic acid (*C. A.* **9**, 603) and 50 cc. concd. HCl. After boiling for 3 periods of 7–8 hrs. each and changing the HCl and Zn as necessary, the resulting *heneicosoic acid*, $Me(CH_2)_{19}CO_2H$, was recrystd. repeatedly from acetone. It forms needles, m. 73–4°; *silver salt; methyl ester*, lustrous scales, m. 49°; *amide*, from the acid and $SOCl_2$, followed by concd. aq. NH_3, needles, m. 110° *α-Bromoheneicosoic acid*, from the acid chloride and Br, needles, m. 65° *droxyheneicosoic acid*, needles, m. 93–4°. θ-Ketomargaric acid ma by the above method (Clemmensen's, *C. A.* **8**, 1112, 1528), whi general application.

Structure of methyleneglycerol and cinnamylideneglycerol DAVID H. PEACOCK. Ardeer. *J. Chem. Soc.* **107**, 815–8(19 *brucine salt of the hydrogen phthalate* (*A*) *of methyleneglycero* evidence of its partial accomplishment obtained. Thi $CH_2.O.CH_2.O.CHCH_2OH$. (*B*) forms an *o-nitrobenzoate*, m. 129°. *Cinnamylideneglycerol*, crystals, m. 110–12° until a vigorous condensation occurs, yields a *compou* if the components are heated at 150° for 1 hr. an methods by which it is hoped to det. the structur

Constituents of Gloriosa superba. HUBERT AND FRANK TUTIN. Wellcome Chem. Res. L

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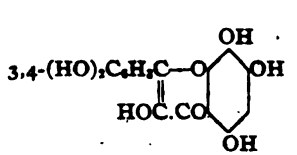
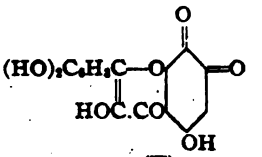
—An investigation of the tubers of this plant, which is native to India and Ceylon and is also known as the "Superb Lily." The aq. ext. readily hydrolyzed amygdalin. 42.52 kg. dried and ground tubers were percolated with hot alc., yielding, after removal of the alc., 10.35 kg. dark brown ext. Steam distn. of this gave 3.8 g. essential oil which probably contained furfural, an aq. liquid (*1*), and some dark, resinous material (*2*). (*1*) was partially concd. *in vacuo* and repeatedly extd. with Et_2O. Et_2O ext.: After concn. this was extd. successively with aq. HCl, $(NH_4)_2CO_3$, Na_2CO_3, and KOH. The last 2 yielded nothing definite, while the 1st yielded a small amt. of an *alkaloid* (*A*), probably $C_{32}H_{38}O_8N_2$, pale yellow leaflets, m. 177–8°, reduces $AuCl_3$ to the metal; the $(NH_4)_2CO_3$ ext., acidified and extd. with Et_2O, gave BzOH, sepd. as the Me ester, and 2 phenolic acids, both very resistant to esterification. By a long series of fractional crystns. from $CHCl_3$-PhH, these were sepd. into *o*-$HOC_6H_4CO_2H$ and *2-hydroxy-6-methoxybenzoic acid* (*B*), m. 135°, gives a violet color with $FeCl_3$, yields, on vigorous methylation with Me_2SO_4 and KOH, *methyl 2,6-dimethoxybenzoate*, needles, m. 88°, also obtained by heating *m*-$C_6H_4(OH)_2$ at 120–30° with H_2O and $(NH_4)_2CO_3$, methylating the resulting mixt. of 2,6- and 2,4-$(HO)_2C_6H_3CO_2H$, and purifying the portion resistant to hydrolysis. After extn. with Et_2O (*1*) was extd. with $CHCl_3$, yielding 16.5 g. colchicine, which was crystd. for the 1st time from EtOAc, forming faintly yellow needles, m. 155–7°; the $[\alpha]_D$ varies with the concn. and diminishes during the 1st 30 min.; *chloroaurate*, needles, m. 209°. Glucose, identified as the osazone, and a very small amt. of choline, isolated as the chloroaurate, were also found in (*1*). (*2*) weighed 436.4 g. and was dissolved in alc., mixed with purified sawdust, and extd. successively with light petroleum, Et_2O, $CHCl_3$, EtOAc, and alc. The 1st ext. (194.7 g.) was dissolved in Et_2O and shaken out with 10% aq. HCl, which removed a small amt. of (*A*). Shaking out with 30% aq. KOH gave a soln. containing only the 3 acids isolated above, while a susbsequent extn. with a very dil. aq. KOH removed the soaps. Acidification of this soln. and taking up in Et_2O gave an insol. portion consisting of phytosterolins, chiefly a *stigmasterol glucoside*, $C_{35}H_{56}O_6$, m. 293° (*acetyl derivative*, leaflets, m. 163°), and sol. fatty acids, sepd. by the usual methods into palmitic acid and a mixt. of oleic and linolic acids. The neutral portion of the ext. yielded very small amts. of an alc. m. 77°, and a hydrocarbon, m. 63–5°; from the alc. mother-liquors of these was isolated a mixt. of stigmasterol and sitosterol, the former being sepd. by means of the tetrabromoacetyl deriv. The only cryst. products obtained from the Et_2O ext. of the resin (87.4 g.) were small amts. of colchicine and what was probably a methylcolchicine. The $CHCl_3$ ext. gave more colchicine and (*B*) while the other exts. yielded nothing definite. M. HEIDELBERGER.

Isoquercetone. MAXIMILIAN NIERENSTEIN. Univ. Bristol. *J. Chem. Soc.* 107, 869–72(1915).—Hydroxyquercetin (I) (N. and Wheldale, *C. A.* 6, 751) is oxidized to



(I)



(II)

isoquercetone (II) by the method used by A. G. Perkin to prep. gossypetone (*A*) (*C. A.* 7, 2385); yield, 87%. (II) differs from (*A*) in its dyeing properties. With Zn dust and Ac_2O (II) gives (I). (II) could not be methylated with MeI or Me_2SO_4, but with exactly 4 mols. CH_2N_2 it gave *isoquercetone tetramethyl ether* (*B*), yellow needles, m. 242–4°; with an excess of CH_2N_2 *7,8-methylenedioxy-3,5-3',4'-tetramethoxyflavone* (*C*), pale yellow needles, m. 192–3°, and traces of a nitrogenous substance are formed; (*B*),

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condenses with 3,4-$(H_2N)_2C_6H_3Me$ to form the *asine*, deep red needles, m. about 328–31° (decompn.). Fused with alkali or boiled with alc. KOH, (*B*) yields only 3,4-$(MeO)_2$-$C_6H_3CO_2H$. *Tetraacetylisoquercetone*, yellow needles, m. and decomps. about 240–2°. (*C*) is best prepd. from (*B*) and 1.5 mols. CH_2N_2. An attempt to remove the CH_2 group by heating at 200° for 5 hrs. with alc. HCl gave considerable C and an amorphous product which was apparently the desired 7,8-$(HO)_2$ deriv., as it yielded the already known hexa-MeO compd. when treated with CH_2N_2. M. HEIDELBERGER.

Disposition of the bonds of the quinquevalent nitrogen atom. I. JULIUS B. COHEN, JOSEPH MARSHALL AND HERBERT E. WOODMAN. Univ. Leeds. *J. Chem. Soc.* **107**, 887–902(1915).—The method of ascertaining mol. symmetry by introducing into the mol. 2 enantiomorphously related active radicals and observing whether or not they produce internal compensation (*C. A.* **4**, 2105) is now applied to pentavalent N compds. If, in the prepn. of the quaternary salt $NR_3R'X$, where R′ is an active group, the salt from NR_3 and R′X should possess a rotation differing from that shown by the salt obtained from NR_2R' and RI, the correctness of Willgerodt's double pyramid formula would be indicated, while identity of the 2 salts would argue in favor of Bischoff's pyramidal formula. This was tested in the case of *l-γ-phenylbutyltriethylammonium bromide* and the salt as prepd. by the 2 methods found to be the same, the rotations being —7.0° and —7.5°. To meet the objection that stability relations might result in the formation of only 1 of the 2 possible forms, attempts were made to prep. salts of the type $NR_2R^+R^-X$, in which case the Bischoff formula would give a salt inactive by internal compensation. With this in view, *sec*-butylcarbinol was selected, but it was found that, while the *d*-alc. could be resolved through the 3-nitrophthalates, hydrolysis of the active esters always resulted in partial racemization. *p*-MeC_6H_4CPh-MeOH was found to be unsuitable owing to the instability of its halogen derivs., while *p*-$MeC_6H_4CHPhOH$ was found to be completely racemized on conversion into the iodide. The *d*- and *l*- forms of $MeCHPhCH_2OH$ and their bromides were then prepd., but could not be combined to form quaternary salts. It is hoped that this difficulty, which is probably due to steric hindrance, will not obtain in the case of the $MeCHPh$-CH_2CH_2OH compds., which are now being worked with. To test the assumption that the introduction of 2 enantiomorphous radicals into positions known to be sym. would lead to the formation of an optically inactive substance the succinbornylamide, *d*-$C_{10}H_{17}NHCOC_2H_4CONHC_{10}H_{17}$-*l*, was prepd. and found to be inactive, while to test the effect of a slight disturbance of the symmetry, the analogous amide of the Me homolog was prepd. and found to have $[\alpha]_D = 3.4°$. *Methyl α-bornylsuccinamate*, from *d*-$C_{10}H_{17}NH_2$ and the reaction product of PCl_5 and $MeO_2CC_2H_4CO_2H$, plates, m. 80–1°, $[\alpha]_D^{20}$ —32.4° in alc.; heated at 170° for 4 hrs. with *l*-$C_{10}H_{17}NH_2$ and light petroleum, it formed *i-succinbornylamide*, needles, m. 242–3°. *Di-d-succinbornylamide*, from the ester and *d*-$C_{10}H_{17}NH_2$, needles, m. 231–2°, $[\alpha]_D^{20}$ —37.2° in alc., similar to *di-l-succinbornylamide;* equal amts. of the 2, dissolved separately in boiling alc. and mixed, gave the *dl-succinbornylamide*, stouter needles, m. 245–6°, less sol. than the other amides. *dl*-$C_{10}H_{17}NH_2$ and $(CH_3CO)_2O$ gave what was apparently a mixt. of the above amides. *Methyl l-bornylmethylsuccinamate*, $MeCO_2CH_2CHMe$-$CONHC_{10}H_{17}$, solidified after some weeks, $[\alpha]_D^{20}$ 17.9°; *i-methylsuccinbornylamide*, by heating this with *d*-$C_{10}H_{17}NH_2$, needles, m. 229–30°, $[\alpha]_D^{18}$ —3.4° in alc. *d-sec*-Butylcarbinol was prepd. according to Freundler and Damond (*Compt. rend.* **141**, 830(1905)). As the alkaloidal salts of the phthalate of the alc. were unsatisfactory to handle, the *3-nitrophthalates* were prepd. The *β-acid ester*, obtained in poor yield by the H_2SO_4 method, forms crystals, m. 113–4°; the *α-acid ester*, obtained from 3-nitrophthalic anhydride and the alc., m. 156–8°. The *brucine salt*, recrystd. 20 times from dil. alc., m. constantly 105°, and yielded an *acid ester* with $[\alpha]_D^{20}$ —2.67° in alc., while the

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cinchonidine salt formed needles which yielded an *ester* with $[\alpha]_D^{20}$ 2.65° in alc. Sapon. of the esters could only be accomplished by hot alkali and this caused partial racemization. *p*-$MeC_6H_4C(:NOH)Ph$ was reduced with Na and alc.: ***phenyl-p-tolylmethylamine hydrochloride***, needles, m. 260°, resolved through the *bromocamphorsulfonate*, forming a ***hydrochloride***, m. 252–4°, which, with $NaNO_2$, gave an *alcohol* with $[\alpha]_D^{20}$ —1.4°. $MeCHPhCH_2CO_2H$ is best prepd. from 1 atom Na, 2 mols. $CH_2(CO_2Et)_2$, and 1 mol. $PhCH_2CH_2Br$. If only 1 mol. $CH_2(CO_2Et)_2$ is used, much $(PhCH_2CH_2)_2C(CO_2Et)_2$ is formed. This also holds true in the case of $NCCH_2CO_2Et$; ***ethyl di-β-phenylethylcyanoacetate***, b_{20} 220°; the acid m. 191° and loses CO_2 when heated, forming ***di-β-phenylethylacetonitrile***, needles, m. 89–90°. $PhMeCHPhCH_2CONH_2$ was converted into ***β-phenylpropylamine***, b_{26} 100°, ammoniacal odor (*phenylurea*, leaflets, m. 153°), which, with $NaNO_2$, gives the alc. (poor yield). $O.CPhMe.CH_2$ is best prepd. according to Tiffeneau (*C. A.* 1, 3005) and Klages (*Ber.* **38**, 1969(1905)). This is best converted into $MeCHPhCHO$ (*A*) by mixing with dil. HCl, which converts about 33% into (*A*) and 67% into the bimol. oxide; after removing (*A*) with steam, concd. HCl is added to the residue, which is boiled 6 hrs., producing more (*A*). Reduction of (*A*) with Zn and HOAc gave the acetate (*B*) of the alc. (*C*). (*C*) forms a ***p-nitrobenzoate***, plates, m. 65°; ***phenylthiourethan***, needles, m. 156°; the ***hydrogen phthalate*** forms prisms, m. 79°, and could not be resolved through the brucine salt; the *3-nitrophthalate*, from (*C*) and the acid anhydride 5 hrs. at 130°, plates, m. 147°, ***brucine salt***, m. 120°; after repeated recrystn. it m. 127–9° and gave the ***d-ester***, m. 142–3°, $[\alpha]_D^{20}$ 16.25° in alc. The ***l-ester*** was obtained from the mother liquors through the cinchonine and cinchonidine salts. The alcs. have $[\alpha]_D^{20}$ ±15.2°; with PBr_3 they yield the corresponding ***bromides***, b_{18} 106–8°, $[\alpha]_D^{20}$ ±15.6°. The *d*-bromide, heated 8 hrs. at 150° with $HNEt_2$, gave ***l-β-phenylpropyldiethylamine*** (*D*), b_{20} 124–5°, $[\alpha]_D^{20}$ —34.4°; ***hydrochloride***, prisms, very hygroscopic; ***hydrobromide***, needles, m. 135–6°. A mixt. of (*D*) and the *l*-bromide gave no quaternary salt in the cold, while $PhMeC:CH_2$ was formed on heating. ***γ-Phenylbutyl alcohol***, b_{22} 138–40°, was prepd. from $MeCHPhCH_2CO_2Me$ with Na and AmOH; yield, 85%. The hydrogen 3-nitrophthalate was converted into the ***strychnine salt***, which finally m. 142°, gave the *l*-ester, m. 95–6°, $[\alpha]_D^{20}$ —56.1° in alc.; the ***alcohol***, $[\alpha]_D^{20}$ —35.2°, yielded a bromide (*E*), $b_{16.5}$ 120°, $[\alpha]_D^{20}$ —72.8°. At 40–50° with $HNEt_2$ for some hrs. it formed ***l-γ-phenylbutyldiethylamine***, b_{18} 152°, $[\alpha]_D^{20}$ —27.75°; with EtBr this gave ***l-γ-phenylbutyltriethylammonium bromide***, hygroscopic needles, $[\alpha]_D^{20}$ —7.5° in alc., also prepd. with $[\alpha]_D^{20}$ —7.0° from (*E*) and NEt_3; the ***iodide*** forms needles, m. 110°. M. HEIDELBERGER.

Formation of chlorinated amines by the reduction of nitro compounds. WINIFRED G. HURST AND JOCELYN F. THORPE. So. Kensington. *J. Chem. Soc.* **107**, 934–41 (1915).—In the prepn. of phenacetine by reduction of the NO_2 compd. with Sn and HCl it was found that considerable of the 3-Cl deriv. was formed. The so-called 3-chlorophenacetine and 3-chlorophenetidine of Orton and King (*C. A.* **5**, 3561) were shown by direct comparison to be the 2-compds. The views of Gabriel and Stelzner (*Ber.* **28**, 251(1896)) as to the mechanism of the entrance of Cl into the nucleus under these conditions are accepted. ***3-Chloro-p-phenetidine*** (*A*), needles, m. 24°, b_{22} 161.5°, is obtained in 90% yield in the reduction of *p*-$O_2NC_6H_4OEt$ with Sn and concd. HCl if the mixt. is not cooled; cooling reduces the yield to 50%, and diln. of the acid results in the formation of only the unsubstituted $H_2NC_6H_4OEt$. After making alk. the reduction mixt. is distd. with steam, the bases taken up in dil. HCl, and extd. with Et_2O after adding excess NaOAc, the (*A*) passing into the Et_2O. This is then shaken with dil. HCl, from which, after addition of an equal vol. of concd. HCl, the ***hydrochloride*** of (*A*), needles, m. 225° (decompn.), seps. (*A*) is very easily acetylated; the *acetyl*

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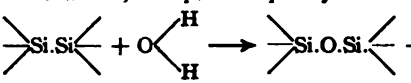
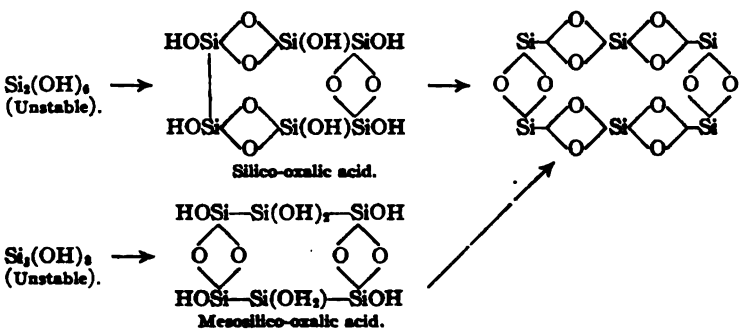
derivative forms prisms, m. 97°, and is non-toxic; in PhH with $AlCl_3$ *3-chloro-4-acetylaminophenol* results, prisms, m. 121°. *3-Chloro-p-anisidine*, b_{21} 156°; *acetyl derivative*, prisms, m. 114°, is not demethylated by $AlCl_3$. *2-Chloro-4-ethoxybenzeneazo-β-naphthol*, red needles, m. 140°. On attempting to prep. hydroxyquinolines from the new bases by the method of Ewins and King (*C. A.* 7, 1491), instead of the expected amides of $AcCH_2CO_2H$ as intermediates there were formed only sym. ureas, apparently with elimination of acetone. *sym.-Di-2-chloro-4-ethoxyphenylurea*, from 15 g. (*A*) and 5 g. $AcCH_2CO_2Et$ at 200–10° for a few min., needles, m. 235°, b. 287° without decompn.; in C_6H_{12} with $AlCl_3$ it gives *sym.-di-2-chloro-4-hydroxyphenylurea*, needles, m. 251°; *diacetate*, prisms, m. 227°; these 3 compds. may also be prepd. in poor yield by condensing $CO(NH_2)_2$ with (*A*). 2,4-$Cl(H_2N)C_6H_3OEt$ was prepd. by reducing the product of the action of $KClO_3$ and HCl on *p*-$EtOC_6H_4NO_2$; *sym.-di-3-chloro-4-ethoxyphenylurea*, needles, m. 211°. M. HEIDELBERGER.

Silicon compounds. IX. Action of alkalies and water on hexaethoxysilicoethane, silico-oxalic acid, mesosilico-oxalic acid, and chloropentaethoxysilicoethane, together with some remarks on their constitution. GEOFFREY MARTIN. London. *J. Chem. Soc.* 107, 1043–50(1915).—M.'s theory (*C. A.* 6, 2923) that directly united Si atoms, in the presence of attached O atoms, are quant. sepd. by alkalies with evolution of H according to the scheme:  is now firmly established by the fact that $Si_2(OEt)_6$, whose constitution is certain, evolves the theoretical amt. of H. Using aq. NH_3, it was established by numerous tests that the identical "silica" is formed as end product in the case of both silico-oxalic acid and mesosilico-oxalic acid, this being explained according to the scheme:



In the hope of obtaining further data on the stability of compds. containing OH and Si_2 groups, a study was made of the effect of H_2O on $ClSi_2(OEt)_5$, but no definite substances could be isolated from the complex products of the reaction. M. H.

Yohimbine (quebrachine). GEORGE BARGER AND ELLEN FIELD. Lister Inst. and Bedford Coll., London. *J. Chem. Soc.* 107, 1025–30(1915).—Spiegel's formula for the anhydrous base $C_{22}H_{28}O_3N_2$ (*A*) is confirmed (*Ber.* 38, 2825(1905)). Contrary to S., however (*Chem. Ztg.* 23, 59(1899)), the analogy with cotarnine and hydrastinine, in which cases the free bases contain 1 mol. more H_2O than their salts, is supported by the compn. of yohimbine methiodide, $C_{22}H_{26}O_4N_2.MeI$, m. about 250°. In $CHCl_3$ (*A*) combines with 1 mol. Br to form *monobromoyohimbine hydrobromide*, $C_{22}H_{25}O_4N_2Br.HBr$, pptd. by Et_2O, micro-crystals, m. 296–8° (decompn.); the free base could not be crystd.; in $CHCl_3$ with 1 more mol. Br it gives a ppt. of *dibromoyohimbine hydrobromide*, $C_{22}H_{26}O_4N_2Br_2.HBr$, needles, m. 296°. In an attempt to hydrolyze (*A*) in concd.

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H_2SO_4 for a few min. there was formed *yohimbinesulfonic acid*, $C_{22}H_{28}O_6N_2S$, crystals, m. 292–5°; an identical product is obtained from quebrachine, further confirming the identity of the 2 alkaloids. Owing to the small amts. of material available nothing definite was learned from oxidation expts., except that 30% H_2O_2 increases the O content without causing marked degradation. Distn. with soda-lime *in vacuo* of yohimbic acid (S.) (*barium salt*, $(C_{21}H_{25}O_3N_2)Ba.2C_{21}H_{26}O_3N_2$) gave feebly basic platelets, m. 167°, while under atm. pressure in a current of H a distillate was obtained which, when acidified, yielded to Et_2O a base of fecal odor (*picrate*, $C_{16}H_{12}N.C_6H_3O_7N_3$, red, m. 154–5°), probably an ethyl- or dimethylindole, and, when made alk., gave what was apparently a quinoline deriv.; picrate, $C_{11}H_{11}N.C_6H_3O_7N_3$.

M. HEIDELBERGER.

Additive and substitutive compounds of mercuric nitrite with organic thio derivatives. I. PRAFULLA C. RÂY. *Proc. Chem. Soc.* **30**, 140(1914).—S compds. containing the SH group or tautomerizing to form this group first react as follows: $—SH + Hg(NO_2)_2 \longrightarrow —SHgNO_2 + HNO_2$, the compd. formed then combining with HgS, HgO, or $Hg(NO_3)_2$. Formulas of typical examples are given. M. HEIDELBERGER.

Mercuration of aromatic amines. Preliminary note. GILBERT T. MORGAN AND J. CAMPBELL ELLIOTT. *Proc. Chem. Soc.* **30**, 186–7(1914).—The usual conditions are varied to the extent of working in MeOH and boiling for 2 min. On pouring into aq. KI, 1 g. $PhNH_2$ and 6 g. $Hg(OAc)_2$ give a ppt. of $C_6H_4(HgI)_2$ and $C_6H_3(HgI)_2$; *m*-$MeC_6H_4NH_2$ and other bases with *o*- and *p*-positions free behave similarly. Ph_2NH reacts with 5–6 mols. $Hg(OAc)_2$; *o*-$MeC_6H_4NH_2$ and -NMe_2 with 2 mols.; *p*-$MeC_6H_4NH_2$, MeC_6H_4NHMe and $MeC_6H_4NMe_2$ with 1 mol.; α- and β-$C_{10}H_7NH_2$ with 1 and 2 mols., resp. HI removes some of the Hg from these compds. M. HEIDELBERGER.

Quercitrin. ARTHUR G. PERKIN. *Proc. Chem. Soc.* **30**, 201(1914).—P. acknowledges priority of Brauns (*Arch. Pharm.* **242**, 561(1904)) and Moore (*C. A.* **5**, 867) on the question of the formula $C_{21}H_{20}O_{11}$ and m. p. 183–5° of quercitrin. Cf. *C. A.* **8**, 3022. M. HEIDELBERGER.

***p*-Chlorophenylselenious acid.** GILBERT T. MORGAN AND J. CAMPBELL ELLIOTT. *Proc. Chem. Soc.* **30**, 248–9(1914).—A well cooled aq. soln. of *p*-$ClC_6H_4N_2Cl$, NaOAc, and alc. KSeCN gave *p-chlorophenyl selenocyanate*, yellow leaflets, m. 50–1°; with aq. alk. it formed ClC_6H_4SeH, oxidized to the *diselenide* by H_2O_2. Oxidation of either of these with alk. $KMnO_4$ gave the Na salt of *p-chlorophenylselenious acid*, needles, m. 178°, amphoteric. M. HEIDELBERGER.

Preparation of 3-nitro-*o*-toluidine. JOHN H. HADFIELD AND JAMES KENNER. *Proc. Chem. Soc.* **30**, 253–4(1914).—The following procedure, based on Wülfing's method for the prepn. of *o*-$O_2NC_6H_4NH_2$ (D. R.-P. 65212, 66060), was used: 18 g. $(CONHC_6H_4Me)_2$ and 96 g. H_2SO_4 were heated on the H_2O bath until a test was sol. in H_2O, then cooled to 50° and gradually treated with a mixt. of 12 g. HNO_3 (d. 1.42) and 12 g. H_2SO_4, cooling to keep the temp. from rizing above 50°. After some hrs. at room temp. 50 cc. H_2O were added and the mixt. heated under a reflux at 140° until the soln. was clear. After 50 min. more at 150°, the soln. was dild. and the base removed by steam. Yield, 8.5 g. M. HEIDELBERGER.

Aromatic selenium compounds. FRANK L. PYMAN. *Proc. Chem. Soc.* **30**, 302–3 (1914).—An attempt to prep. the Se analog of arsanilic acid. The compds. described below are probably *m*-compds. $(PhNH_2)_2H_2SeO_4$ gave no substituted compd. on heating. Nitration of $PhSeO_2H$ gave a *nitrophenylselenious acid*, yellow needles, m. 156–7°, reduced successively to *nitrophenyl diselenide*, yellow spears, m. 83°, and *aminophenyl diselenide*, of which the *dihydrochloride* forms yellow grains, m. 291–2°. *Acetaminophenyl diselenide*, yellow needles, m. 185–6°, dissolved in concd. HNO_3, gives *acetamino-*

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phenylselenious acid, $AcNHC_6H_4SeO_2H$, needles, m. 209°, oxidized by $KMnO_4$ to salts of the corresponding selenic acid; *aminophenylselenic acid*, needles, m. 229°. M. H.

Action of mercuric, cupric and platinic chlorides on organic sulfur compounds. PRAFULLA C. RÂY. *Proc. Chem. Soc.* 30, 304(1914).—With $PtCl_4$, EtSH and $(HS)_2C_2H_4$ give *chloromercaptides* of the formulas $ClPt(SEt)_2PtCl(SEt)_2$ and $C_2H_4:S_2:PtClSC_2H_4SH$. Thiourea and thioacetamide react in the enolic form in the same sense; thiosemicarbazide loses NH_3 and gives $ClPt\left(SC\begin{matrix}NH\\|\\N\end{matrix}\right)_2.HCl$. The action of $ClCH_2CO_2H$ on these S compds. is entirely analogous to that of $PtCl_4$. $CuCl_2$ gives similar cupric chloromercaptides which are not basic and therefore do not add HCl.

M. HEIDELBERGER.

Derivatives of 2-pyridylhydrazine and 2-quinolylhydrazine. ROBERT G. FARGHER AND REGINALD FURNESS. Oxford. *J. Chem. Soc.* 107, 688–99(1915).—When 26 g. of 1-methylpyridone (cf. Decker, *C. A.* 6, 225) were heated in a "Geissler flask" with 40 g. $POCl_3$ and 60 g. PCl_5 for 9 hrs. at 150–60°, a nearly theoretical yield of 2-ClC_5H_4N (*A*), b. 170° (cf. Fischer, *Ber.* 31, 611(1898)) was obtained. By boiling a mixt. of 34 g. of (*A*) and 140 g. $N_2H_4.H_2O$ for 4 hrs., 21 g. of *2-pyridylhydrazine* (*B*), b_{140} 185°, b_{20} 140°, m. 46°, decompg. rapidly on exposure to air, were prepd. The *picrate* of (*B*), needles, m. 160–1° (decompn.); the *chloroplatinate*, blackens 160°, m. 256° (decompn.). The following *2-pyridylhydrazones* were synthesized by condensing (*B*) with aldehydes and ketones: *acetaldehyde derivative*, $C_5H_4NNHN:CHMe$, needles, m. 70°; *benzaldehyde derivative*, needles, m. 148°; *acetone derivative* (*C*), rhombic prisms, m. 73°; b_{25} 145°, b_{180} 70°; *acetophenone derivative*, m. 90°; *pyruvic acid derivative* (*D*), $C_5H_4NNHN:CMe\text{-}CO_2H.1.5H_2O$, long needles, m. 188°; *ethyl ester* of (*D*), needles with $1H_2O$ from EtOH, m. 53°; anhydrous crystals from light petroleum, m. 74°. Attempts to induce pyridole formation from (*C*) or (*D*) by fusing with $ZnCl_2$ proved fruitless. The *acetyl derivative* of (*A*), prisms, m. 150°. *Phthalyl-2-pyridylhydrazide*, $\underline{O.CO.C_6H_4.C:NNHC_5H_4N}$, rhombic prisms, m. 208°. *2-Pyridylsemicarbazide*, $C_5H_4NNHNHCONH_2$, granules, m. 186°, was formed by treating (*B*) in HCl with an equiv. amt. of KNCO. (*B*) and $AcCH_2CO_2Et$ gave rise to *1-[2'-pyridyl]-3-methyl-5-pyrazolone*, $\underline{N:CMe.CH_2.CO.NC_5H_4N}$, m. 110°, giving a blue coloration with $FeCl_3$. When treated with $NaNO_2$, (*B*) in aq. AcOH yielded *1,2,3,9-benzoisotetrazole*, $\underline{\overbrace{N.CH:CH.CH:CH.C}:N.N:N}$, elongated prisms, m. 159°, exploding when touched with a red-hot rod. (*B*) when boiled with an excess of HCO_2H formed *1,2,9-benzoisotriazole*, $\underline{\overbrace{N.CH:CH.CH:CH.C}:N.N:CH}$, extremely hygroscopic and characterized by means of its *chloroplatinate*, does not m. 300°, and its *silver nitrite derivative*, $C_6H_4N_3.AgNO_2$, needles, decompg. 228° in a capillary but exploding if heated in larger quantity. The interaction of 2-chloroquinoline and (*B*) led to the formation of *s-2-pyridyl-2-quinolylhydrazine*, $C_5H_4NNHNHC_9H_6N$, m. 177°, yielding the corresponding azo compd. (not characterized) when oxidized with HNO_2. 2-Quinolylhydrazine (*F*) (cf. Perkin and Robinson, *C. A.* 8, 909) gave rise to the following hydrazones: *acetaldehyde derivative*, silky needles, m. 151°, whose alc. soln. slowly turned pink when treated with small amts. of KOH; *acetophenone derivative*, yellow needles, m. 122°; *pyruvic acid derivative* (*E*), yellow ppt. darkening at 170°, decompg. 200°; *ethyl ester* of (*E*), m. 134°; *levulinic acid derivative*, m. 200° (decompn.); *ethyl acetoacetate derivative* (*F*), needles, m. 90°. The following derivs. of (*F*) were also prepd.: *acetyl deriva-*

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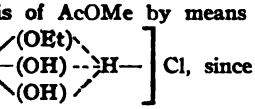
tive, rhombic prisms, m. 195°; *benzoyl derivative*, needles, m. 204°; *succinyl-2-quinolylhydrazide*, $O.CO.CH_2.CH_2.C:NNHC_9H_6N$, pale yellow rhombs, m. 160°; *phthalyl-2-quinolylhydrazide*, orange plates, m. 236°, and *1-[2'-quinolyl]-3-methyl-5-pyrazolone*, $N:CMe.CH_2.CO.NC_9H_6N$, fluffy needles, m. 140°, prepd. from (*F*) by heating on a H_2O bath. LOUIS E. WISE.

Kinetics of the decomposition of acyl derivatives of phenols by means of alcohol in the presence of acids and alkalies. MARIAN JONES AND ARTHUR LAPWORTH. *Proc. Chem. Soc.* 30, 141–3(1914).—AcOPh has been most closely studied with special reference to the catalytic action of acids and alkalies on its decompn. in alc. soln. With both types of catalyst the main initial action consists in the irreversible formation of free PhOH (or phenoxide) and AcOEt. The complete sapon. is therefore the result of 2 successive reactions, the 2nd of which consists in the sapon. of AcOEt, complicated by phenoxide formation. By estimating the amt. of free PhOH (or phenoxide) formed after varying time periods, J. and L. have studied the velocity of the 1st reaction, which is greatly accelerated by both acid and alkali, the relative influence of the catalyst being of the same magnitude as in the case of alkyl ester hydrolysis. The mechanism of hydrolysis in the case of the Ph esters is therefore probably the same as in the case of alkyl esters. As the Ph group is not readily detached from O, the hydrolysis apparently involves a rupture of the mol. R.CO.O.Ph at (*a*), not at (*b*). J. and L. suggest that the complex which is probably formed as an intermediate product in the hydrolysis of AcOMe by means of aq. HCl may be represented by the formula:  Cl, since the symmetry of the reaction indicates that the H atom in the "polymolecule" is labile in the intramol. sense and may be regarded as influenced by all 3 O atoms. LOUIS E. WISE.

Action of nitrous acid on dimethylpiperazine. PRAFULLA CHANDRA RÂY. *Proc. Chem. Soc.* 30, 143–5(1914).—A continuation of R.'s investigations on the amine nitrites. $C_2H_4(NH_2)_2.HCl$ (or HBr) when treated with $AgNO_2$ usually decompd. with the formation of $(CH_2OH)_2$ or $CH_2.O.CH_2$, but in 2 instances gave rise to an impure mononitrite, $C_2H_4(NH_2)_2.HNO_2$(?). By using alc. $PhCH_2NHMe$, R. was able to obviate the decompn. of the corresponding nitrite into the NO deriv. (cf. *C. A.* 7, 2931) and succeeded in prepg. pure cryst. *benzylmethylammonium nitrite*, $PhCH_2NHMe.HNO_2$. When α,2,5-dimethylpiperazine hydrochloride (*A*), in H_2O, was treated with $AgNO_2$ and the product concd. *in vacuo*, cryst. *nitrosodimethylpiperazinium nitrite* (*B*), $ON-N.CHMe.CH_2.NH(HNO_2).CHMe.CH_2$, was obtained. If, however, the reaction was carried out in alc. soln., *dimethylpiperazinium dinitrite* (*C*), $C_6H_{14}N_2.2HNO_2$, was isolated. Conductivity measurements on solns. of (*B*) and (*C*) (of which full data are given) show that (*B*) gives rise to 2 univalent ions, whereas (*C*) furnishes 3 ions, thus confirming the structure assigned to these compds. LOUIS E. WISE.

Thio derivatives of β-naphthylamine. WILLIAM REEVE AND SAMUEL SMILES. *Proc. Chem. Soc.* 30, 147–8(1914).—*Di-β-dimethylaminonaphthyl sulfide*, $(Me_2N.C_{10}H_6)_2S$, pale yellow needles from alc., m. 145°, was prepd. by treating 3 mols. of β-$Me_2NC_{10}H_7$ in light petroleum with 1 mol. SCl_2. *Di-β-aminonaphthyl sulfide* (*A*), needles, m. 166°, was synthesized by treating β-$H_2N.C_{10}H_7$ in $PhNO_2$ with S and PbO (? — R. and S. do not state *which* lead oxide), at 160°, removing $PhNO_2$ with steam, dissolving the residue in AcOH, pptg. with H_2O, and finally recrystg. from alc. The yields are

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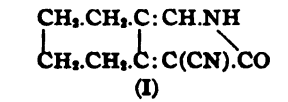
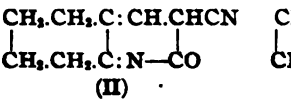
poor. (*A*) in hot aq. mineral acids is readily oxidized by atm. O to an insol. blue compd. LOUIS E. WISE.

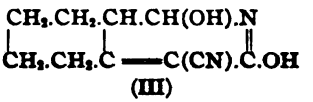
Formation of heterocyclic compounds from hydroxymethylene ketones and cyanoacetamide. Preliminary note. HEMENDRA K. SEN-GUPTA. *Proc. Chem. Soc.* **30**, 148–50(1914).—Open chain hydroxymethylene ketones condense with H_2NCOCH_2CN in the presence of $C_5H_{11}N$ or Et_2NH to form hydroxypyridine derivs. Under similar conditions hydroxymethylenecycloketones give rise to either quinoline or isoquinoline derivs. with the elimination of 1 or 2 mols. H_2O. A typical example is furnished by $CH_2.CH_2.CH_2.CH_2.CO.C:CHOH$, which condenses with H_2NCOCH_2CN to form a mixt. of *compounds*, $C_{10}H_{10}ON_2$ (*A*), m. 250° (formulas (I) or (II)), and $C_{10}H_{12}O_2N_2$ (*B*),



(I)



(II)



(III)

m. above 300°, which is probably either (III) or the isomeric quinoline derivative. Since (*A*) and (*B*) when hydrolyzed both yield the same *acid*, $C_{10}H_{11}O_2N$ (*C*), m. 265°, G. believes that (*B*) is an intermediate product in the formation of (*A*). (*C*) on heating loses CO_2 and passes into a *compound*, m. 204°. EtCOCMe:CHOH and H_2NCOCH_2CN give rise to a mixt. of products which on hydrolysis yield an *acid*, $C_8H_{11}O_2N$, m. 278–9°, with the evolution of CO_2 and the formation of a *compound*, $C_8H_{11}ON$, m. 136–8°. Under similar conditions $CH_2.CH_2.CH_2.CHMe.CO.C:CHOH$ gives the *compound* $C_{11}H_{12}ON_2$, m. 242°, yielding on hydrolysis an *acid*, $C_{11}H_{13}O_2N$, m. 260°, which loses CO_2 to form the *compound* $C_{10}H_{13}ON$, m. 142°. Very similarly, $CH_2.CHMe.CH_2.CH_2.CO.C:CHOH$ gives rise to an isomeric *compound*, $C_{11}H_{12}ON_2$, m. 228–9°, forming the *acid*, $C_{11}H_{13}O_2N$, m. 284°, which on heating is converted into the *compound* $C_{10}H_{13}ON$, m. 206–7°. LOUIS E. WISE.

Rotatory powers of *d*- and *l*-isoamarine and of their respective tartrates. HENRY L. SNAPE. *Proc. Chem. Soc.* **30**, 151–2(1914); cf. *J. Chem. Soc.* **77**, 784(1900).—*d*-Isoamarine in AcOEt has $[\alpha]_D$ 69.06°; *l*-isomer, $[\alpha]_D$ —68.23°. Since these values were detd. with the aid of a rather crude polarimeter and are therefore only approx., exact measurements in the case of the resp. tartrates were made by Pope. The following data are given, the values for $[\alpha]_{Hg\ violet}$, $[\alpha]_{Hg\ green}$, $[\alpha]_{Hg\ yellow}$ and $[\alpha]_D$ being given in each set in the order mentioned: *d*-isoamarine *d*-tartrate in abs. alc. 270°, 137°, 117°, 112°; in 90% alc. (by wt.) 299°, 152°, 130°, 124°; *l*-isoamarine *d*-tartrate in abs. alc. —237°, —115°, —98.8°, —96.3°. LOUIS E. WISE.

Asymmetric tervalent nitrogen. Preliminary note. TOM S. MOORE. *Proc. Chem. Soc.* **30**, 182–4(1914).—Preliminary expts. indicate that *2-p-sulfophenyl-2,3-dihydro-1,2,4-naphthaisotriazine* (*A*) (prepd. according to the general method given by Meldola and Forster, *J. Chem. Soc.* **59**, 678(1891) and possessing similar properties to the Ph derivs. described by them) is a *dl*-mixt. and offers definite evidence of asymmetry in tervalent N atoms attached to 3 different groups. The brucine salt of (*A*) was treated at 0° with an *excess* of *N* NaOH and the resulting soln. freed from brucine by extn. with $CHCl_3$. The alk. soln. thus obtained was *slightly but distinctly d-rotatory*, but this activity disappeared after a few hrs. Parallel expts. with (*A*) itself gave only inactive solns. When the brucine salt of (*A*) was treated with only the *equivalent* amt. of NaOH, the resulting soln. of Na salt was inactive (cf. Mills and Bain, *C. A.* **5**, 479; **8**, 1267), indicating that the previous excess of alkali had hindered racemization. The brucine salt of (*A*) when added to $CHCl_3$ first dissolved completely, then

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deposited some of the acid. Polarimetric measurements made at intervals on the filtered soln. indicated that the brucine salt contained an excess of *d*-acid, which racemized gradually on standing. LOUIS E. WISE.

A new chlorocamphor. Preliminary note. THOMAS M. LOWRY AND VICTOR STEELE. *Proc. Chem. Soc.* **39**, 201(1914).—α-Chlorocamphor (*A*) may be converted into the stereoisomeric *α'-chlorocamphor* (*B*), m. 117°, by the use of Kipping's method (*ibid* **21**, 125(1905)). The following are the values for $[\alpha]_{6708}$, $[\alpha]_D$, $[\alpha]_{5461}$ and $[\alpha]_{4358}$ in the order mentioned of the isomers in alc. soln.: (*A*), 70°, 97°, 119.2°, 242.9°; (*B*), 27.5°, 41.4°, 54.1°, 140.9°. LOUIS E. WISE.

2,3-Dibromonaphthalene. Preliminary note. WILLIAM P. WYNNE. *Proc. Chem. Soc.* **30**, 204(1914).—From $H_2N.C_{10}H_6CO_2H$ as parent substance W. prepd. the following compds.: *3-bromo-β-naphthoic acid*, needles, m. 220°, *methyl ester*, needles, m. 67°; *hydraside*, microneedles, m. 218°; *urethan*, needles, m. 114°; *3-bromo-2-naphthylamine*, scales, m. 168°; *acetyl derivative*, scales, m. 172°; *2,3-dibromonaphthalene* (*A*), silvery rectangular scales, m. 140°. (*A*) has the same m. p. as the "2,7-deriv." described by Jolin (*Bull soc. chim.* [ii] **28**, 514(1877)), but the identity of the 2 compds. has not yet been established. It is evident that the compd. m. 68° formed in the dibromination of $C_{10}H_8$ is *not* $2,3\text{-}C_{10}H_6Br_2$ (cf. Guareschi, *Gazz. chim. ital.* **11**, 542; Canzoneri, *ibid* **12**, 424; Armstrong and Rossiter, *Proc. Chem. Soc.* **7**, 184). LOUIS E. WISE.

Some arylidenedimethylpyrones and their salts. ALFRED A. BOON, KENNETH J. MCKENZIE AND JOHN TROTTER. *Proc. Chem. Soc.* **30**, 205–8(1914).—Arylidenedimethylpyrones (whose structures have been previously detd. (cf. *C. A.* **9**, 63), were prepd. by the action of suitable aldehydes on dimethylpyrone, in the presence of alc. NaOH. The following compds. and their salts are described: *bisfurylidenedimethylpyrone*, $C_{17}H_{12}O_4$, m. 200°; *hydrochloride*, red, m. 196°; *nitrate*, red, m. 166–7°; *sulfate*, red, m. 202–3°; *bisbenzylidenedimethylpyrone*, $C_{21}H_{16}O_2$, yellow flakes, m. 168°; *hydrochloride*, yellow, m. 166–7°; *nitrate*, yellow, m. 141–2° (decompn.); *sulfate*, yellow, m. 155–6°; *bisanisylidenedimethylpyrone*, $C_{23}H_{20}O_4$, pale yellow flakes, m. 199°; *hydrochloride*, red, m. 147–8°; *hydrobromide*, red (m. p. not sharp); *hydrofluoride*, yellow (after drying to const. wt.), decomps. when heated; *nitrate*, red, decomps. 146°; *sulfate*, $(C_{23}H_{20}O_4)_2H_2SO_4$, dark red, m. 86–7°; *sulfate*, $C_{23}H_{20}O_4.H_2SO_4$, bright red, m. 101°; *chloroplatinate; formate*, $C_{23}H_{20}O_4(CH_2O_2)_2$, red, m. 99° (unstable when exposed to air, turning yellow and losing acid); *formate*, $C_{23}H_{20}O_4.CH_2O_2$, yellow hair-like crystals, decomp. when heated; *acetate*, yellow hairs; *oxalate*, $(C_{23}H_{20}O_4)_2C_2H_2O_2$, yellow needles; *oxalate*, $C_{23}H_{20}O_4\text{-}C_2H_2O_2$, yellow, m. 174–5°; *normal tartrate*, red crystals; *succinate*, yellow; *salicylate*, yellowish red; *picrate*, red needles, m. 211°. All of these salts undergo hydrolysis when heated with H_2O. LOUIS E. WISE.

Carajura and chica red. Preliminary note. ARTHUR G. PERKIN. *Proc. Chem. Soc.* **30**, 212–3(1914).—P. examd. a mixt. of substances obtained from "*Bigonia chica*" from which it is said Central American Indians prepare "carajura," a rare pigment, supposedly identical with "chica red" (cf. Erdmann, *Jahresb.* **1857**, 487). The material examd. (containing the Ca compds. of at least 2 coloring matters besides bark or peat), after treatment with aq. HCl, yielded, on extn. with alc., a resinous mixt., a fraction of which (*a*) was sol. while another fraction (*b*) was insol. in boiling PhH. *Carajurin* (*A*), $C_{18}H_{18}O_5$(?), ruby needles, m. 204–6°, sol. in aq. alkali with a red color, practically devoid of dyeing properties, was isolated from (*a*). (*A*) when treated with mineral acids readily yielded the following *oxonium salts* in the form of orange needles: *sulfate*, $C_{18}H_{16}O_5.H_2SO_4.H_2O$(?); *hydrobromide*, *hydrochloride* (decompg. 100°); and *chloroplatinate*. An *acetyl derivative* of (*A*), needles, and a *bromo derivative*, orange needles,

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were prepd. (but no m. ps. or analytical figures are given). HI converts (*A*) with the loss of 2 mols. of MeI into *carajuretin hydriodide*, bright scarlet needles, which when treated with cold C_5H_5N gave rise to *carajuretin*, $C_{14}H_{12}O_5$(?), scarlet needles, m. above 330°, sol. in alkalies with a reddish violet color. On dry distn. (*A*) evolves a trace of oil (resembling anisaldehyde in odor). When fused with KOH, (*A*) formed *p*-HO-$C_6H_4CO_2H$ and an unidentified colorless *compound*, m. 185–7°. (*A*) apparently resembles the "anhydrohydroxybenzopyranols" described by Bülow and Wagner (*Ber.* **34**, 1199(1910)). The insol. portion (*b*) when extd. with Et_2O yields *carajurone*, scarlet powder with a beetle-green luster (analysis and m. p. not given), containing more O than (*A*) and possessing very marked dyeing properties. Leaves of a "bushrope" from British Guiana yielded a lake considered "checa red" which contained a dyestuff producing alizarin-like shades. This lake, however, appears to differ somewhat from the "carajura" described above. LOUIS E. WISE.

Alizarin α-methyl ether. JOSEF OESCH AND ARTHUR G. PERKIN. *Proc. Chem. Soc.* **30**, 213(1914).—By the interaction of $N{:}N.CH_2$ in Et_2O and monoacetylalizarin in $PhNO_2$ followed by the deacetylation (cf. *J. Chem. Soc.* **75**, 447(1899)) O. and P. prepd. alizarin α-methyl ether, needles, m. 177–8° (acetate, m. 211–3°), which is identical with the natural product present in Chay root, *Oldenlandia umbellata* (cf. *ibid* **64**, 1160(1893); **91** 2068(1907)). LOUIS E. WISE.

Preparation of phenyl benzyl ether. DAVID H. PEACOCK. *Proc. Chem. Soc.* **30**, 247–8(1914).—The ether was conveniently prepd. by the following method: To 475 g. of PhOH and 280 g. KOH in 300 g. H_2O at 80°, a mixt. of 500 g. of $PhCH_2Cl$, 80 cc. alc. and 0.5 g. powdered Cu was added, with frequent shaking. The mixture was heated under reflux in an oil bath, at 105–15°, and after violent ebullition had ceased, was kept boiling gently for 3 hrs. The non-aq. layer was then washed with warm H_2O, dissolved in Et_2O, the soln. dried, the Et_2O evapd. and the residue fractionally distd. By this means 73 g. of $PhCH_2Cl$ were recovered and 575 g. of $PhOCH_2Ph$ were obtained. LOUIS E. WISE.

Benzenesulfonyl derivatives of *o*-aminoazo compounds. Preliminary note. GILBERT T. MORGAN AND JOHN H. COOK. *Proc. Chem. Soc.* **30**, 249(1914).—$PhSO_2$ derivs. of aromatic diamines condense with aromatic nitrosohydrocarbons in AcOH, giving rise to azo derivs. 3,4-$(H_2N)(PhSO_2NH)C_6H_3Me$ and 4-ONC_6H_4Me gave rise to *4-benzenesulfonyl-4-amino-3-azotoluene*, 3,4-$(p\text{-}MeC_6H_4N{:}N)(PhSO_2NH)$-$C_6H_3Me$, golden yellow needles, m. 151–2°. Similarly, 4,3-$(H_2N)(PhSO_2NH)C_6H_3Me$ and 4-ONC_6H_4Me yielded *3-benzenesulfonyl-3-amino-4-azotoluene*, dark yellow needles, m. 156°. LOUIS E. WISE.

A simple demonstration of the formation of biuret from the interaction of carbamide and cyanic acid. EMIL A. WERNER. *Proc. Chem. Soc.* **30**, 262–3(1914).—A proof of the truth of the theory that biuret is formed by the interaction of carbamide and its dissociation product HN:CO was furnished by the following expt.: To 3 g. carbamide in 4 cc. concd. HCl and 2 cc. H_2O were gradually added 4 g. of powdered KNCO. After filtering (to remove sepd. cyanelide) the soln. gave a typical "biuret reaction" with alk. $CuSO_4$. An estimation of the biuret showed that about 4% of the theoretical amt. had been formed, a result which might reasonably be expected from the fact that the greater part of HNCO is lost because of hydrolysis, polymerization and volatilization. The reaction is represented by the following equation: $HN{:}C(NH_2)OH + HNCO \longrightarrow NH[C(:NH).OH]_2$, and is strictly analogous to that by which isobiurets (isobiuret or "enol form") have been previously obtained. Cf. Bruce, *J. Chem. Soc.* **26**, 449 (1904). LOUIS E. WISE.

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Progressive bromination of toluene. JULIUS B. COHEN AND PAVITRA K. DUTT. *Proc. Chem. Soc.* **30**, 271(1914); cf. *C. A.* **8**, 2365.—In order to meet Holleman's criticisms (cf. *C. A.* **8**, 3016), C. and D. present conclusive evidence that *m*-BrC_6H_4Me (*A*) *is* formed in the bromination of PhMe. C. and D. mixed $Br.C_6H_4CO_2H$, m. 157–8° (prepd. by oxidation of the BrC_6H_4Me obtained by direct bromination of PhMe), with a pure specimen of *m*-$BrC_6H_4CO_2H$, m. 157.5–8.5°, formed by brominating $PhCO_2H$. The mixt. m. 157–8°. Analytical figures for (*A*) are also given. LOUIS E. WISE.

Attempts to resolve metallic salts of amino acids and other coördinated compounds. Preliminary note. THOMAS V. BARKER. *Proc. Chem. Soc.* **30**, 295–8(1914).—B.'s attempts to effect certain optical resolutions in the province of coördinated compds. have thus far been unsuccessful. These expts. are being continued, however, with the object of resolving (if possible) Cu glycine (*A*), and other metallic salts and coördinated compds. The researches of Ley, Delépine and Chugaev in this field are also very briefly discussed. LOUIS E. WISE.

A method of separating the dihydroxybenzenes. THOMAS GRAY AND GEORGE S. CRUIKSHANKS. *Proc. Chem. Soc.* **30**, 305(1914).—A mixt. of catechol (*A*), resorcinol (*B*) and quinol (*C*) was dissolved in a small amt. of H_2O and an excess of aq. $Pb(OAc)_2$ added. The Pb salt of (*A*) was pptd. and filtered. The filtrate, after acidification with H_2SO_4, was extd. with Et_2O and (*B*) and (*C*) recovered by evapn. of the dried Et_2O soln. (*B*) and (*C*) were then converted into the di-*p*-nitrobenzoates, and the latter sepd. by crystn. from acetone, in which the (*C*) deriv. is sparingly sol., whereas the (*B*) deriv. is readily sol. Sapon. of the corresponding nitrobenzoates in an atm. of H or N and subsequent acidification regenerated (*B*) and (*C*). (*A*) *di-p-nitrobenzoate*, hair-like needles from acetone, m. 164°; the (*B*) *derivative*, hair-like needles, m. 182°; the (*C*) *derivative*, needles or hexagonal plates, m. 256°. LOUIS E. WISE.

Preparation of ethyl malonate and ethyl cyanoacetate. HAROLD A. SCARBOROUGH. *Proc. Chem. Soc.* **30**, 306–7(1914).—$CH_2(CO_2Et)_2$ was prepd. by the following method: 100 g. CH_2ClCO_2H in 200 cc. H_2O was heated to 50°, neutralized with Na_2CO_3, the soln. filtered and treated with 80 g. KCN. After heating on a H_2O bath for 0.5 hr. the mixt. was evapd. to dryness under diminished pressure, the residue gradually treated with a mixt. of 200 cc. alc. and 160 cc. H_2SO_4, heated on a H_2O bath for 4 hrs., H_2O added and the ester extd. with Et_2O. The washed and dried Et_2O soln. yielded 104 g. of $CH_2(CO_2Et)_2$ fractionated under 100 mm. pressure, b_{760} 196–200°. $NCCH_2CO_2Et$, b_{760} 205–8°, was synthesized as follows: 100 g. CH_2ClCO_2Et in 100 cc. of 97% EtOH was mixed with 55 g. of powdered KCN, gradually warmed and left until the close of a vigorous reaction. The mass was then boiled for 15 min., KCl removed by filtration and the EtOH distd. off under reduced pressure. The residue was treated with Et_2O, the Et_2O soln. filtered, the Et_2O removed by distn. and the ester distd. as rapidly as possible under diminished pressure. The yield was 45% of the theory. L. E. WISE.

Preparation of hydrocarbons of the formula Ph_2CHR, R being an aromatic nucleus. F. BODROUX. *Compt. rend.* **161**, 131–3(1915).—Ph_2CH in 86.8% yield was obtained by the action of PhMgBr (*A*) on Ph_2CHBr in Et_2O. $(C_{10}H_7)_2CHCl$ and (*A*), however, yielded $[(C_{10}H_7)_2CH]_2$ instead of the expected $(C_{10}H_7)_2CHPh$. *p*-MeC_6H_4MgBr reacting with Ph_2CHBr formed *p*-$MeC_6H_4CHPh_2$. Ph_2CHBr reacted violently with α-$C_{10}H_7MgBr$, yielding in some cases α-$C_{10}H_7CHPh_2$, m. 134°; in other cases the isomeric modification, m. 149°. Cf. Leherne, *Ber.* **13**, 358; Acree, *Ber.* **37**, 617; Ullmann, *Ber.* **38**, 2215. Also in *Bull. soc. chim.* **17**, 318–20(1915). LOUIS E. WISE.

The resolution of β-nataloin and β-homonataloin. E. LÉGER. *Compt. rend.* **161**, 133–5(1915); cf. *C. A.* **8**, 1411, 2678.—It is possible to resolve β-nataloin (which is probably inactive in the pure state) into the "natural" *l*-nataloin (*A*) and a *d*-nataloin (*B*). A β-nataloin ($[\alpha]_D$ —24°), when subjected to 4 successive crystns. from 60%

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alc., yielded (*A*), $[\alpha]_D$ —146.5°. The combined mother liquors from (*A*) gave rise to a mixt. of nataloins, $[\alpha]_D$ —15°, which on recrystn. finally yielded (*B*), $[\alpha]_D$ 63° (unchanged by further crystn.). L. suggests that (*B*) may be an inseparable mixt. of 5 mols. of (*A*) and 2 mols. of a hypothetical *d*-nataloin, $[\alpha]_D$ approx. 146°, and that the resolution of β-nataloin is only a partial one. L. made an unsuccessful attempt to prep. pure inactive β-nataloin by the following method: Inactive pentaacetylnataloin was sapond. and the alc. soln. of the sapond. product treated with H_2O. A cryst. ppt. formed, which was washed with 60% alc. and *not* subjected to further crystn. (in order to prevent resolution). The ppt., however, proved to be fairly pure (*B*). On adding cold H_2O to a hot alc. soln. of β-homonataloin ($[\alpha]_D$ 8°), a ppt. of a *homonataloin* (*C*), microneedles, $[\alpha]_D$ 63°, unaltered by further crystn., was formed. The mother liquors yielded a crop of "natural" *l*-homonataloin, $[\alpha]_D$ —147.6 (*D*). L. believes that (*C*) may be an inseparable mixt. of 2 mols. (*D*) and 5 mols. of a *d*-isomer, $[\alpha]_D$ approx. 149°.

LOUIS E. WISE.

Influence of sodium hydroxide on the synthesizing and hydrolytic properties of α-glucosidase (air-dried glucosidase obtained from "bottom" yeast). E. BOURQUELOT AND A. AUBRY. *Compt. rend.* 161, 184–6(1915).—NaOH, when added in increasing amts. to mixts. containing fixed amts. of glucose, MeOH and α-glucosidase, has no effect on glucoside formation *until the free acid due to the yeast extract is completely neutralized*. As soon as a mixt. becomes faintly alk., the synthesizing action of the enzyme is completely arrested, and the isomerizing and oxidizing action of the alkali upon the glucose becomes manifest. Increasing amts. of alkali cause the oxidation (?) of correspondingly larger quantities of glucose. Enzyme inhibition on the one hand, and isomerizing and oxidizing action of alkali on the sugar, on the other, are clearly shown to be 2 entirely distinct processes. Another series of expts., in which fixed amts. of Me α-*d*-glucoside and "bottom yeast" ext. were treated with varying amts. of NaOH, indicated that the hydrolytic properties of α-glucosidase were completely checked as soon as alkalinity had been reached. These expts. furnish additional evidence that the synthesizing and hydrolyzing enzymes are identical (*i. e.*, = α-glucosidase).

LOUIS E. WISE.

A. Mayer's experiments and the phenomena of isomerization of cyclic compounds. N. KIZHNER. *J. Russ. Phys. Chem. Soc.* 47, 831–5(1915).—Mayer (*Phil. Mag.* 1879, 18) showed that when a stationary bar magnet is placed above a floating group of small magnetic needles in such a manner that all the like poles of the latter point in the same direction and are turned towards the unlike pole of the magnet, the needles arrange themselves in definite configurations, according to their number and according to whether the system is at rest or kept in motion. With groups of more than 4 needles 2 configurations are produced in each case, one of which is stable, while the other is unstable, changing to the stable configuration when the system is disturbed by shaking or rotation. These configurations may be called isomeric, and they present striking similarities with the configurations of isomeric cyclic C compds. (in which the C atoms may be taken as playing the parts of the needles), both in respect to form and in respect to the transformation of unstable into stable cycles.

H. M. GORDIN.

Formation of γ-amino derivatives in the preparation of amino compounds of pyridine. A. E. CHICHIBABIN. *J. Russ. Phys. Chem. Soc.* 47, 835–8(1915).—In order to show that the γ-H of pyridine is also replaceable by NH_2 by C.'s method (*C. A.* 9, 1901), α,α-lutidine was made to react with NH_2Na. The product was γ-aminolutidine, though the reaction was slow and the yield small.

H. M. GORDIN.

Reaction of amylene with trichloroacetic acid in different solvents. G. E. TIMOTHEEV AND L. M. ANDREASOV. *J. Russ. Phys. Chem. Soc.* 47, 838–48(1915).—As was shown by Nernst and Hohmann and by Konovalov (*C. A.* 2, 619), CCl_3CO_2H (*a*)

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readily reacts with $Me_2C:CHMe$ (*b*) with formation of $CCl_3CO_2C_5H_{11}$ when C_6H_6 (*c*) is used as solvent, and the concn. of the latter has no influence on the limit of the esterification, while with certain ethers or esters as solvents the limit of the esterification is greatly reduced. Since this may best be accounted for by assuming that ethers and esters are capable of forming oxonium compds. with (*a*), thus reducing its active mass, expts. were made in which varying amts. of other O compds. (acetone, MeCOEt and $PhNO_2$) were added to solns. of (*a*) and (*b*) in (*c*) at 25° and at 50°. In order to eliminate the influence of changes in vol., the mixts. were in all cases dild. with (*c*) to the same vol. The results were as follows: Both at 25° and 50° the addition of the 1st portions of the above ketones (25–30%) greatly reduced the limit of the esterification, while their further addition had but little effect. At 50° the lowering of the limit of esterification for the same amt. of ketone is at 1st greater than at 25°, the curve for 25° being above that for 50°. But with increasing concns. of ketone the difference gradually disappears, and then the limit of esterification at 50° even exceeds that at 25°, the 2 curves intersecting each other. This is ascribed to the unequal effect of heat on esters and on the addition compds. (solvates) of (*a*) and ketones. Solvates being more readily decompd. by heat than esters, the active mass of (*a*) is at 50° increased by the same amt. of ketone to a greater extent than at 25°. Since the inhibiting effect of ketones is thus due to their union with (*a*), any other substance capable of uniting with them but not with (*a*) ought to increase the active mass of the latter by removing them from the sphere of interaction with (*a*), thus facilitating the esterification. This was corroborated by carrying out the esterification in a mixt. of $CHCl_3$ and acetone. The interaction of (*a*) with (*b*) in (*c*) in presence of $PhNO_2$ was strikingly different from the other cases. The addition of 2% of the latter facilitated the esterification instead of lowering it. The limit of the reaction in this case reached a max. at 4% $PhNO_2$ and then gradually decreased, the curves at the 2 temps. becoming almost straight parallel lines. With a view of finding an explanation of this, expts. are in hand. H. M. GORDIN.

Synthesis of tetramethylenediguanidine. A. KIZEL. *J. Russ. Phys. Chem. Soc.* **47**, 898–908(1915).—By adding NH_2CN (*a*) all at once to $(CH_2CH_2NH_2)_2$ (*b*) Kossel obtained only agmatine (*C. A.* **5**, 1449), and the yield of the latter was only 9.36%. Adding (*a*) to (*b*) in small portions at a time the yield was increased to 34.44%, and the reaction product was found to contain a considerable amt. of *tetramethylenediguanidine*, either $(CH_2)_4[NHC(NH_2):NH]_2$ or $NH_2(CH_2)_4NHC(:NH)NHC(NH_2):NH$, the 1st formula being more probable. The new base was obtained in the form of the following salts: *Sulfate*, $C_6H_{16}N_6.H_2SO_4$, spherical aggregates of obtuse needles, darkens 288–9° and m. 291° (decompn.), sol. in 156.5 parts of H_2O at 21°. *Carbonate*, chalk-like powder when its aq. soln. is evapd. to dryness, and cryst. when the soln. is only strongly concd. or a mixt. of Et_2O + alc. is added to it. *Hydrochloride*, transparent prisms. *Picrate*, $C_6H_{16}N_6.2C_6H_3(NO_2)_3OH$, bright yellow prisms, darkens 239° and m. 253–4° (decompn.), sol. in 1666 parts of H_2O at 21° *Picrolonate*, yellow amorphous powder, decomps. 278–9°. *Chloroaurate*, $C_6H_{16}N_6.2HAuCl_4$, dark yellow shining needles, m. 172.5°. *Chloroplatinate*, $C_6H_{16}N_6.H_2PtCl_4$, orange plates or feathery aggregates, darkens 215°, m. 224° (decompn.). The best precipitants for the base are picric and phosphotungstic acids. It may also be pptd. as a *silver salt*. The work shows that in this method as well as in that of Ripke (*C. A.* **5**, 3571) both mono- and diguanidines are produced in amts. varying with the conditions. H. M. GORDIN.

Bisulfite compounds of azo dyes. N. N. VOROZHTZOV. *J. Russ. Phys. Chem. Soc.* **46**, 1342(1914) (Proceedings).—Applying Reinking, Dehnel and Labhardt's reaction (*Ber.* **38**, 1069) to the bisulfite compds. of benzeneazo-α-naphthol and some other azo dyes, solns. capable of reducing indigo carmine were obtained. H. M. G.

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Gustavson's compound of aluminium bromide with a hydrocarbon. L. A. CHUGAEV. *J. Russ. Phys. Chem. Soc.* **46**, 1738–9(1914) (Proceedings).—In his investigation, "Org. compds. in their relation to Al halides" Gustavson describes the formation of $AlBr_3.C_4H_8$ in the interaction of $AlBr_3$ + HBr with various aliphatic hydrocarbons. For various reasons C. considers this compd. to be a combination of $AlBr_3$ with erythrene or with a polymer of the latter, the analytical data corresponding as well to $AlBr_3.C_4H_6$. H. M. GORDIN.

Acetylene dichlorides. G. CHAVANNE. *Bull. soc. chim. belg.* **28**, 234–40(1914). —In a previous investigation (*C. A.* **7**, 1180) of the ethylenic isomerism of the acetylene dichlorides, C. found that the velocity of the reaction of the isomer b. 60.25° (*a*) with alc. KOH was approx. 20 times as great as in the case of the isomer b. 48.35° (*b*); he, therefore, concluded from the Wislicenus theory of *cis*-elimination that (*a*) has the constitution of the *trans* form. In view of the investigations of Michael, Pfeiffer and Frankland and the consequent rejection of the W. theory the above facts indicate that (*a*) has, in fact, the *cis* structure. The equil. mixt. consists, therefore, of approx. 80% of the *cis* and 20% of the *cis-trans* forms. $(CHClBr)_2$, obtained by fixation of Br by either (*a*) or (*b*), regenerates the equil. mixt. of the 2 latter when the Br is eliminated by the action of Zn in presence of alc. The following precautions are necessary in order to obtain uniform results: Granulated Zn (75–80 g.) and 150–200 g. alc. are heated gently on a H_2O bath in a flask equipped with a reflux condenser and dropping funnel; 1 g. mol. of $(CHClBr)_2$ is gradually introduced by the dropping funnel when the alc. is warm. The reaction is instantaneous; when allowed to commence in the cold it is quite difficult to control. The liquid is then gently boiled for several hrs. and allowed to cool; an excess of alc. is added and the mixt. is distd. on a paraffin bath through a Young 3–5 section dephlegmator. The (*a*) and (*b*) are vaporized as binary mixts. with alc. and as ternary mixts. with alc. and H_2O at 45° and above. The distillate is washed 2–3 times with H_2O and dried with $CaCl_2$. In an expt. with 4 g. mols. $(CHClBr)_2$ 375 g. $C_2H_2Cl_2$ were obtained (theoretical yield, 388 g.); the d. indicated an equil. with 78% of the *cis*-isomer. Neither $(CHClBr)_2$, Zn, $CaCl_2$ nor $ZnBr_2$ in presence of alc. produces isomerization of $C_2H_2Cl_2$, hence the 2 forms of $C_2H_2Cl_2$ are originally formed from $(CHClBr)_2$ in the equil. mixt. An attempt to throw light on the problem by the formation of dichlorosuccinodinitrile by the action of KCN in alc. on $(CHClBr)_2$ only resulted in the formation of CClBr:CHCl. C. then studied the kinetics of the fixation of Br by the 2 forms of $C_2H_2Cl_2$. According to the Pfeiffer and Frankland theory Br would be added in the *trans* position in the isomer which shows the greater velocity of fixation. If it should happen that the greater velocity of fixation occurs in the case of the *cis-trans* isomer, then the $C_2H_2Cl_2Br_2$ produced would be inactive and incapable of resolution into active components, while in the alternative case the racemic form of $C_2H_2Cl_2Br_2$ would be produced. The rate of fixation of Br was studied (in the absence of a solvent) at rather small initial concns. of Br under uniform conditions of illumination (Nernst lamp) and at temps. near 12.5°; the successive concns. of Br were detd. by pouring samples into an excess of KI soln. and titrating the liberated I with standard $Na_2S_2O_3$. In the case of both the *cis-trans* and the *cis* isomers the velocity const. *K* increased during the initial period of the expt. and then became const. (monomol. reaction equation); the limit of this practically const. value was 0.36 for the *cis-trans* isomer, 0.18 for the *cis* isomer and 0.23 for the equil. mixt. The results (ratio of the rates for the 2 isomers) are in accord with those obtained by Herz and Rathmann for rates of fixation of Br by the 2 $C_2H_2Cl_2$ isomers in CCl_4 soln. The results are difficult of explanation, however, since, if the addition of Br is accompanied by isomerization, the *K* values for the *cis-trans* isomer would be expected to show a progressive decrease toward the fixed limit corresponding to

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the equil mixt., while a corresponding increase toward the same limit would be anticipated in the case of the *cis* isomer. The nature of the disturbing factor has not been ascertained. H. S. PAINE.

Gondang-wax (Cera ficí). I. A. J. ULTÉE. *Pharm. Weekblad* **52**, 1097–1101 (1915).—An exam. of the sap of the *Ficus variegata* brought out the fact that the ficoceryl alcohol of Greshoff and Sack (*Rec. trav. chim.* **20**, 65(1901)) is identical with β-amyrin. The sap is coagulated by warming or the addition of alc., and the wax extd. repeatedly with large vols. of boiling alc. From this a product settles out (m. 60–4°) which is sapond. with alc. KOH, yielding an alc. m. 197.5°, identical with β-amyrin, $[\alpha]_D^{29°}$ 87.35°. An alc.-sol. substance occurring in the wax, which G. and S. had regarded as the free alc., was shown to be lupeyl acetate. P. V. D. MEULEN.

Action of diphenylurea chloride (diphenylaminoformyl chloride) on organic bases. WILLIAM M. DEHN AND EARL M. PLATT. *J. Am. Chem. Soc.* **37**, 2122–30(1915); cf. *C. A.* **8**, 3797.—Ph_2NCOCl (*a*) reacts sluggishly in Et_2O with most bases; the reactions are promoted by sunlight and heat. Additive products are first formed which, under the action of heat, H_2O, etc., yield the Ph_2NCO derivs. of the bases. (*a*) reacts immediately with piperidine (*b*), *p*-$MeC_6H_4NH_2$ and some of the lower fatty amines. These facts are irreconcilable with the usual conceptions of the ionic theory, especially as (*a*) + (*b*) give $Ph_2NCONC_5H_{10}.HCl$, but this compd. cannot be obtained from $Ph_2NCONC_5H_{10}$ + HCl. A more satisfactory explanation is that (*a*) + (*b*) ⟶ $Ph_2NCO.Cl:NHC_5H_{10}$ ⟶ $Ph_2NCON(HCl)C_5H_{10}$. Anhydrous Et_2O solns. of equimol. amts. of (*a*) and the base were set aside in corked bottles or, in some cases, heated in sealed tubes or boiled under a reflux condenser, filtered and the dried and washed ppts. analyzed for Cl or hydrolyzed with H_2O, while the original Et_2O solns. were shaken with dil. HCl to remove the unchanged base and the unchanged (*a*) and the Ph_2NCO deriv. in the Et_2O sepd. With a slight excess of *p*-$MeC_6H_4NH_2$ after 4 hrs. at 70° is obtained *p-tolyldiphenylurea*, $MeC_6H_4NHCONPh_2$, prismatic needles, m. 130°; solns. of 1 g. (*a*) and 0.4 g. base at first remain clear, then become cloudy and in 4 months in direct sunlight deposit 0.2 g. of wart-like masses of crystals, m. above 200°, sol. in H_2O with a spinning motion, and apparently contain 50% of *p-tolyldiphenylurea hydrochloride*. *m*-$MeC_6H_4NH_2$ after 4 hrs. at 115° gives *m-tolyldiphenylurea*, rhombic plates from alc., m. 125–6°; 1 g. (*a*) and 0.4 g. base after 4 months in sunlight form 0.2 g. of brown-red balls giving the spinning motion with H_2O. *o*-$MeC_6H_4NH_2$ after 4 hrs. at 115° gives *o-tolyldiphenylurea*, rectangular plates and needles, m. 119°; in sunlight only traces of microscopical prismatic needles are obtained after 5 months. The rapidity of this reaction diminishes in the order *p*-, *m*-, *o*-compd., possibly because an intermediate compd., $MeC_6H_4NH_2:ClCONPh_2$, is formed and this complex may possess a different tendency to rearrange according as the Me group is in the *p*- or *o*-position, *e. g.*, the centers of gravity of the $MeC_6H_4NH_2$ groups being differently located may possibly influence the N affinities, so that the N of the *o*-compd. does not exert sufficient attraction on the Ph_2NCO group to produce a mol. rearrangement at room temp. in the sunlight. $PhNHNH_2$ after 2 hrs. boiling gives rhombic plates, m. 145–50°, probably $PhNHNHCONPh_2$ (found, 13.92% N; Richter, *Diss.*, gives 193° as the m. p. of this compd. while Rape and Labhardt, *Ber.* **33**, 247(1900), state that $NH_2NPhCONPh_2$ m. 128°); 1 g. (*a*) and 0.47 g. base after 2 months in sunlight give 0.45 g. crystals, m. 227°, with 7.15% Cl, which evidently contain the above compd. or its HCl salt. Below are the results obtained with other bases: *p*-$MeC_6H_4NHNH_2$ and Ph_2NNH_2, a little ppt. after 2 months; $PhCH_2NPhNH_2$, considerable crystals after 20 hrs. boiling; α-$C_{10}H_7NH_2$, a heavy ppt., containing a dye; in sunlight; benzidine, sheaves of needles; *p*-$HOC_6H_4NH_2$, a blue-black dye after 4 hrs. at 200°; *o*-$ClC_6H_4NH_2$, a little gray ppt. after 2 months in sunlight, a dark brown solid after 4 hrs. at 200°;

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p-$BrC_6H_4NH_2$, wedge-shaped crystals after 2 months in sunlight; *p*-$MeOC_6H_4NH_2$, deep, red, gummy oil after 4 hrs. at 200°; iso-$BuNH_2$, sheaves of needles and a refractory oil; $C_6H_{11}NH_2$, crystals, soften 183°, m. 230°, and a refractory oil; $C_7H_{13}NH_2$, a refractory oil; [illegible], immediately a voluminous ppt., m. 213°, containing 75% of *diphenylpiperidylurea hydrochloride*, gives a spinning motion with H_2O and on hydrolysis yields hexagonal and rhomboidal plates, m. 122°, with 77.17% C and 7.31% H, evidently the *free base* [given in the original as *triphenylpiperidylurea*.—Abstr.] which, however, does not give a ppt. of the HCl salt with HCl in PhMe even after 5 months in sunlight; iso-Bu_2NH, rhombic plates, m. 240°, and hygroscopic needles, m. 60°; iso-Am_2NH, crystals, m. 147–230°, and a refractory oil; Ph_2NH, amorphous ppt.; phthalimide, no reaction after 2 hrs. at 220° in xylene; quinoline, pyridine and picoline, amorphous, red-black and chocolate-colored ppts., resp.; NEt_3, prismatic needles; iso-Bu_3N, cubes and spindle-shaped crystals; iso-Am_3N, needles; $PhNEt_2$, dirty brown ppt.; Ph_2CH_2N, cubic masses and boat-shaped prisms. C. A. Roulleb.

Action of trioxymethylene on *p*-xylene in the presence of aluminium chloride. Ralph C. Huston and Dwight T. Ewing. *J. Am. Chem. Soc.* 37, 2394–9(1915); cf. Frankforter and Kohatsu, *C. A.* 8, 3035.—H. and E. show that *p*-xylene reacting with $(CH_2O)_3$ in the presence of $AlCl_3$ does not give CH_2PH_2 and anthracene derivs. in equimol. amts. as required by the equation of F. and K.; and that it is possible to obtain polynuclear compds. containing as high as four C_6H_4 rings connected by CH_2 groups, pointing to the dissociation of the [illegible] into HCHO. It may be that steric hindrance prevents the formation of the anthracene compd. from *p*-xylene, since the 2nd connecting group must enter between 2 groups in the *m*-position to each other. From 50 g. *p*-xylene stirred 1 hr. with 12 g. [illegible] at about 45° while being treated with 20 g. of $AlCl_3$ in small portions, allowed to stand 5 days at 0°, decompd. with ice and treated with Et_2O was obtained a yellow ppt. which, after drying 6 weeks in the air and being recrystd. 8 times from C_6H_6, yielded 1.5 g. *methylenedi-di-p-xylylmethane* (*a*), [illegible], $Me_2C_6H_3CH_2C_6H_3Me$-$CH_2C_6H_3Me_2CH_2C_6H_3Me_2$, begins to darken 206°, m. 204–5° partial decompn.), mol. wt. 463, forms a reddish brown, slightly fluorescent soln. in C_6H_6. The fluorescent Et_2O ext. of the original reaction mixt. yielded 4.2 g. *di-p-xylylmethane* (*c*), b. 313–6°, seps. from alc. in long needles, m. 60–0.5°, mol. wt. 231. The portion of the Et_2O ext. b. 330–40° sepd. from C_6H_6-EtOH in plate-like clusters of filaments, m. 157–8°, does not show the slightest fluorescence in cryst. form or in soln. Not enough was obtained for analysis, but since it is intermediate in properties between (*b*) and (*c*) it is probably a trinuclear compd. The analysis of the product, m. 286–7°, obtained by F. and K. from mesitylene agrees more closely with the values calcd. for the tri- or tetranuclear compd. than with those calcd. for tetramethylanthracene and in its properties the compd. closely resembles (*b*). Chas. A. Roulleb.

Action of trioxymethylene on the various hydrocarbons in the presence of aluminium chloride. G. B. Frankforter and V. Kohatsu. *J. Am. Chem. Soc.* 37, 2399–401(1915).—Answer to H. and E. (preceding abstr.). C. A. Roulleb.

Action of trioxymethylene on *p*-xylene in the presence of aluminium chloride. II. Ralph C. Huston and Dwight T. Ewing. *J. Am. Chem. Soc.* 37, 2401(1915). —Reply to F. and K. (preceding abstr.). Chas. A. Roulleb.

Hydantoins. XXXIV. Interaction of hippuric acid with thiocyanates. Treat B. Johnson, Arthur J. Hill and Bernard H. Bailey. *J. Am. Chem. Soc.* 37, 2406–16(1915); cf. *C. A.* 9, 1701.—A suggested explanation of the difference in behavior of K and NH_4 thiocyanates toward hippuric acid (*a*) is that the NH_4SCN, when heated with Ac_2O, rearranges into $CS(NH_2)_2$. This explanation is untenable because (1) it would require an entirely different mechanism to explain the formation of the 2-thio-3-benzoylhydantoin (*b*) from an inorg. thiocyanate (cf. *C. A.* 7, 3908); (2) NH_4SCN does not undergo such a rearrangement; (3) if $CS(NH_2)_2$ were formed, it would not con-

dense with the (*a*) but immediately give $AcNHCSNH_2$ with the Ac_2O at 100° (Kohmann, *C. A.* **9**, 2654). When 2 g. (*a*) and 2 g. acetylpersulfocyanic acid (which is formed by heating NH_4SCN with Ac_2O; Klason, *J. prakt. Chem.* **38**, 368(1888)) in 9 cc. Ac_2O and 1 cc. AcOH were heated 1 hr. at 100°, there was no reaction; addition of 9 more cc. Ac_2O and further heating for 20 hrs. yielded 85% of unchanged Ac_2O and BzOH but no (*b*). Again, 2 g. (*a*) and 2 g. KCNO heated 15 min. in 9 cc. Ac_2O and 1 cc. AcOH gave only cyanuric acid and BzOH; the former acid was also formed when aceturic acid and glycocoll were used instead of (*a*). Various inorg. thiocyanates (2 g. of each) heated 1 hr. with 2 g. (*a*) in 9 cc. Ac_2O and 1 cc. AcOH gave the following yields of (*b*): NH_4, 2.3; Li, 1.1; Na, 0.1; K, 1.1; Mg, 1.9; Ca, 0.6; Sr, 1.2; Ba, 0.6; Mn, 1.0; Zn, 0.0 g. From 2 g. each of (*a*) and $CS(NH_2)_2$ heated 1 hr. at 100° in Ac_2O-AcOH is obtained 1.3 g. $AcNHCSNH_2$, whereas 1 g. each of NH_4SCN and $CS(NH_2)_2$ and 2 g. (*a*) similarly treated yielded 0.9 g. each of (*b*) and $AcNHCSNH_2$. In the prepn. of (*b*), $(EtCO)_2O$ can be substituted for Ac_2O, 2 g. each of NH_4SCN and (*a*) heated 1 hr. at 100° in 10 cc. $(EtCO)_2O$ giving 2.4 g. (*b*); with KSCN instead of NH_4SCN only a gum was obtained which yielded 0.5 g. BzOH with alkali. When 10 g. Bz_2O is substituted for the $(EtCO)_2O$, there is obtained 1.0 g. $BzNHCSNH_2$ and 0.7 g. BzOH but no (*b*) [in the theoretical part of the paper it is stated that some (*b*) is formed in this case also—Abstr.]; in other words the NH_4SCN is rearranged catalytically into $CS(NH_2)_2$ at 100° by the BzOH; that the (*a*) plays no part in the rearrangement was shown by heating 2 g. each of NH_4SCN and Bz_2O 1 hr. at 85–90°; this gave 0.6 g. $BzNHCSNH_2$ and BzOH. When 10 g. NH_4SCN (dried at 110°) are heated 3 hrs. on the H_2O bath with 14 g. Ac_2O protected from moisture, allowed to stand 12 hrs., filtered from the 1.8 g. of orange solid, concd. to a small vol. and poured into cold H_2O, 0.5 g. more of the solid deposits; both fractions proved to be isodithiocyanic acid. **XXXV. New method of synthesizing glycocyamidine compounds and the conversion of glycocyamidine into isomers of creatinine.** Treat B. Johnson and Ben. H. Nicolet. *Ibid* 2416–26.—Et benzoylpseudoethylthiohydantoate (*a*) (*C. A.* **6**, 356) reacts with amines with evolution of mercaptan and formation of a guanidine which then loses alc. and condenses to a glycocyanamidine. Thus (*a*) in alc. allowed to stand 5 days with 1.5 mols. aq. NH_3 and then heated 0.5 hr. on the H_2O bath evolved EtSH and gave *2-benzoylglycocyamidine*, $BzN{:}C(NH).CO.CH_2.NH$, needles, blackens and decomps. 230°.

(*a*), covered with its own wt. of alc., and somewhat more than the calcd. amt. of 33% aq. $MeNH_2$ allowed to stand in a stoppered flask 24 hrs. and boiled 0.5 hr. deposited on cooling 85% of *1-methyl-2-benzoylglycocyamidine* (*b*), $BzN{:}C(NMe).CO.CH_2.NH$,

distorted needles, m. 214°; some of the 1-benzoyl-2-methyl compd. (*c*) was also formed but was not isolated. When dissolved in alc. and digested 8–10 hrs. with excess of concd. HCl (*b*) gave 75% of a methylglycocyamidine-HCl, identical with Korndörfer's salt (*Arch. Pharm.* **242**, 620(1904)), granular crystals, changes in appearance at 200°, blackens above 250°, decomps. about 283–5°; picrate, prisms, m. 196°; chloroaurate, yellow prisms, m. 166°. From 3 g. of the crude salt (obtained by hydrolysis of the crude Bz compd.) boiled 1 hr. with 1 mol. BzH and 3 mols. AcONa in 20 cc. AcOH was obtained 3.35 g. condensation product which, although m. 219–20° quite sharply after crystn. from alc., was sepd. by means of cold 5% NaOH into the insol. *1-methyl-4-benzalglycocyamidine* (*d*), flat orange prisms from alc., m. 246–7° (violent effervescence), and the sol. *2-methyl-4-benzal compound* (*e*), needle-like prisms from alc., m. 223°; this shows that the crude Bz compd. was a mixt. of (*b*) and (*c*). Together with (*d*) was always obtained a very small amt. of a *substance* sepg. from alc. in needles, m. 237–9°, insol. in hot 5% KOH, which contained the same % of N (20.7) as (*d*), and was probably a stereoisomer of (*d*) (cf. *C. A.* **9**, 909). (*e*) was also obtained in 2 other

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ways: (1) in poor yield by heating 2-ethylmercapto-4-benzalhydantoin with alc. $MeNH_2$ 36 hrs. at 100°; (2) in about 55% yield by alkylating 2-thiohydantoin with MeI in dil. alc. in the presence of alkali, concg. to about 20 cc., heating 6 hrs. at 100° with excess of $MeNH_2$, concg. as much as possible on the H_2O bath, and boiling 3 hrs. in AcOH with approx. the calcd. amt. of BzH and excess of NaOAc. 4-Benzalglycocyamidine, cryst. powder from alc., m. 297° (Ruhemann and Stapleton, *J. Chem. Soc.* 77, 239(1900)), was obtained by condensing glycocyamidine with BzH in AcOH and NaOAc; with MeI and KOH it gives (*d*). From 2 g. 2-thiohydantoin converted into 2-methylglycocyamidine (*f*) as above by successive treatment with MeI and $MeNH_2$, then concd. to a small vol., dild. with 20 cc. of 5% KOH, heated 10 min. on the H_2O bath, made strongly acid with HCl, digested 8 hrs. on the H_2O bath, concd. as far as possible at 100°, condensed with BzH in AcOH and AcOH and sepd. as above by means of 5% KOH, was obtained only 30% of (*d*), while the alk. soln. yielded (*e*), showing that the (*f*) is hydrolyzed by alkalies to its glycocyamine, which with acid reforms some of the original (*f*) together with some of its 2-Me isomer. C. A. ROUILLER.

The metallic ureas (BARBIERI) 6. Carbohydrates of pine wood (HÄGGLUND) 11D.

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11. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

FRANK P. UNDERHILL.

Stalagmometric studies of solutions of colloids and crystalloids. IV. Diffusion in surface layer. L. BERCELLER. *Intern. Z. phys. chem. Biol.* 1, 124–32(1914); *J. Chem. Soc.* 108, II, 88.—In the measurement of surface tension of solns. by means of Traube's stalagmometer, it was found that the more quickly the drops form and fall the greater the value obtained for the surface tension. The reason for this is that the surface layer forms so rapidly in the drop that the dissolved substance has not sufficient time to accumulate in the layer and reach the concn. that it reaches when the surface of the liquid is at rest. Hence, the slower the rate of diffusion of a substance, the more marked should be the alteration of the surface tension of its soln. with change in the rate of drop formation. In accord with this, it is found that solns. of colloids, such as the proteins and soaps, produce much greater variations than solns. of the crystalloids, such as acetone and the alcohols. H. D.

Affinity and biological activity of acids. W. KOPACZEWSKI. *Intern. Z. phys. chem. Biol.* 1, 420–32(1914); *J. Chem. Soc.* 108, I, 104.—Acids influence various biological processes in different ways, and the order in which a series of acids can be arranged, corresponding with the magnitude of the reaction which they exert on one biological process, differs from the order for any other process. The conclusion is reached that the degree of dissociation and the hydrogen ion concn. are not the only factors in detg. the extent of action of the acids. H. D.

Capillarimeter, viscostagonometer, and stalagmometer. I. TRAUBE AND R. SOMOGYI. *Intern. Z. phys. chem. Biol.* 1, 485–90(1914); *J. Chem. Soc.* 108, II, 87–8.—These instruments give practically identical results for the surface tension of non-colloidal liquids with colloidal liquids, the viscostagonometer gives lower results than the stalagmometer because the material slowly moves toward the surface. The former instrument measures the surface tension of older surfaces, while the latter measures those newly formed. The capillarimeter cannot be used with colloidal liquids. H. D.

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Dynamic conception of the organic individual. C. M. CHILD. *Proc. Nat. Acad. Sci.* 1, 164–73(1915). H. DUBIN.

Chondrosamine. P. A. LEVENE AND F. B. LA FORGE. *Proc. Nat. Acad. Sci.* 1, 190–1(1915).—While conducting investigations on the structure of chondroitin-sulfuric acid, Levene and La Forge isolated an α-amino hexose, which they named chondrosamine. Chondrosamine appears to have the configuration of either α-altrosamine or of α-allosamine. H. DUBIN.

Detection of certain enzymes or of the enzyme-forming bodies (zymogenes) in living and dead molds, respectively. Preliminary communication. W. HENNEBERG. *Wochschr. Brau.* 32, 109(1915).—The significance of the so-called vacuole-bodies in yeast and of certain bodies occurring in bacteria and molds and apparently resembling fatty substances (usually termed volutin or metachromatic bodies) is not yet much understood. They usually were considered as reserve material for they disappear in starving cells. In the course of extensive studies (on which H. will report later) on the cell nuclei, it was definitely established that there must be a close connection between these bodies and the enzymic activity of the cell. They are probably enzymes or their corresponding zymogenes. L. W. HAAS.

The reaction and calcium content of milk as factors in the coagulation process. THOMAS H. MILROY. Queen's Univ., Belfast. *Biochem. J.* 9, 215–28(1915).—The range of H^+ concn. in fresh milk was found to be $0.158.10^{-6}$ *N* (p_H.6.80) to $0.310.10^{-6}$ *N* (p_H.6.50) as detd. by the stationary hydrogen electrode method. The addition of K oxalate to milk causes a fall in H^+ concn. owing to the hydrolytic dissociation of the salt. If rennin be added to an "oxalate" milk and the mixt. be kept in a water bath at 38° the H^+ concn. is not found to change during the period of digestion. When $CaCl_2$ is added to an "oxalate" milk the H^+ concn. rizes, but the milk remains uncoagulable until it reaches a higher level than p_H 6.86. Milk kept at a temp. slightly below its b. p. for 1 hr. shows a higher H^+ concn. than the same milk before heating; on the other hand, 0.1645% CaO was found in unheated, and 0.1434% CaO in heated milk. The rize in H^+ concn. in heated milk is evidently due to the sepn. of Ca phosphate in more basic form than it previously existed. The coagulant action of rennin on heated milk is much diminished. This is due to the lowered Ca content, since on raising the % of Ca to the same level as that before heating, the milk coagulates as readily as fresh milk. The coagulability of heated milk may be raised either by the addition of $CaCl_2$ or by raising the H^+ concn. The former does not act simply by raising the H^+ concn. nor the latter simply from its effect upon the sol. Ca content. The acid pptn. zone of caseinogen lies on the acid side of the rennin zone of action, but the latter gradually approaches the former as the Ca content of the mixture is lowered, so that probably the latter is an extension of the former toward the neutral point. The action of the $CaCl_2$ is not simply to complete a process the earlier stages of which do not require its presence, for from the beginning of the ferment action until its close the rate of transformation of caseinogen into the final product of digestion is dependent upon the Ca content and reaction of the medium. B. HOROWITZ.

The non-acid and non-alkaline hydration of proteins. M. H. FISCHER AND A. SYKES. Cincinnati, O. *Kolloid-Z.* 16, 129–44(1915).—The swelling of gelatin in urea solns. is greater than in pure water. This is not an effect of the alkalinity of the urea, for the addition of acid or NaCl to the urea soln. still further increases the swelling, while the same, if added to an alkali, will decrease the swelling. $MgSO_4$, which has a dehydrating effect if hydration has occurred in acid soln., is without effect upon the hydration in urea soln. Dextrose, on the contrary, causes dehydration if added to urea solns., just the opposite effect from that when added to acid or alkali.

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Pyridine soln. is partly like urea, partly like an alkali, for on adding an acid to the pyridine soln. the swelling first decreases but when the acid concn. is increased, it goes through a minimum (before the equiv. of acid to pyridine has been added) and increases again. Addition of NaCl reduces the swelling, but with increasing concn. of the NaCl the swelling increases, not however reaching the value for pyridine alone. Dextrose added to pyridine soln. decreases the swelling. These last two effects are due to some other factor than the alkalinity of the pyridine. $EtNH_2$ increases the swelling; the effect of added HCl or NaCl indicates that the action of $EtNH_2$ is mostly due to its alkalinity, but the dehydrating effect of added glucose indicates some factor besides alkalinity. Although an intravenous injection of urea does not result in edema, still amines have been shown by Eustis (*Am. J. Med. Soc.* 143, 862) to be closely connected with toxic edema. This perhaps explains why a hypertonic salt soln. containing alkali and glucose is more effective in edema treatment than one containing only alkali. The fact that urea causes soln. of the protein much more readily than acid or alkali indicates that at least two changes are proceeding in the swelling process, one toward hydration and one toward increasing dispersion of the protein.

H. I. Mattill.

Ferment action. XXI. Serum ferments and antiferments after feeding. James W. Jobling, Wm. Petersen and A. A. Epstein. Vanderbilt Univ. *J. Exp. Med.* 22, 129–40(1915).—After feeding, an increase in non-coagulable N of the serum can be detd., reaching a max. in about 6 hrs. This increase is greatest in the portal blood and is partially due to an increase in amino acids. There is no increase in proteoses. There is usually a progressive decrease in serum protease reaching a minimum after from 5 to 7 hrs. The portal blood may show an unaltered or an increased amount of protease. The serum antienzyme shows a slight increase, but is subject to considerable fluctuation. The serum lipase (esterase) shows a slight increase, reaching a max. after 3 hrs. The hepatic blood usually contains the lowest concn. of lipase. **XXII. Serum ferments and antiferments during tryptic shock.** *Ibid* 141–53. The intravenous injection of trypsin in dogs results in a shock similar in many respects to anaphylactic and peptone shock. The injection is followed by a marked rise of serum protease and lipase. The antienzyme usually shows a distinct drop in titer, with a recovery following in from 4 to 24 hrs. The non-coagulable N shows no constant alteration, but is never greatly changed in amt. Inactivated prepns. were followed by symptoms in some respects similar to those following the injection of the active prepn. Subcutaneous and gastric absorption was practically without effect. Intestinal absorption was followed by an increase in serum protease without evidence of intoxication, or by typical symptoms of acute poisoning. The leucocyte curve bears no constant relation to the serum protease or lipase.

G. M. Meyer.

Chymosin and pepsin action. II. New method for abolishing the parallelism between chymosin and pepsin action. Olof Hammarsten. *Z. physiol. Chem.* 94, 104–27(1915).—A method is given for prepg. exts. of pepsin and chymosin. It consists in drying with NaCl, extg. with water and pptg. with 0.2% HCl. In this way various fractions are obtained. In one of these the pepsin predominated while the other usually contained an excess of chymosin. **III. The different sensitiveness of pepsin and of chymosin towards alkali.** *Ibid* 291–323.—A protein-poor but active enzyme soln. was obtained by treating a 0.1% HCl ext. with NaOH until neutral, allowing to stand 20 hrs., centrifuging and emulsifying the ppt. with H_2O and filtering. The filtered soln., containing at times 0.013% solid matter, shows an active chymosin action. The action of the pepsin is much more sensitive to alkali than is that of chymosin. Both enzymes are proteolytic but they differ in the external conditions, chymosin acts either in the presence or absence of HCl, and, to a certain degree,

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better in an acid medium. The optimum acid concn. for the 2 enzymes is different. G. M. MEYER.

The diazo reaction of proteins. HERM. PAULY. *Z. physiol. Chem.* **94**, 284–90 (1915).—If, instead of diazobenzenesulfonic acid, diazobenzenearsonic acid (from atoxyl) is used in testing for histidine and tyrosine, insol. azo dyes which can be easily purified, are obtained. *Tyrosine-bis-azobenzenearsonic acid*, $HO_2CCH(NH_2)CH_2C_6H_2(OH)(N_2C_6H_4AsO_3H_2)_2$, light brown microcryst. powder, with 2 mols. H_2O; sol. in alkali and in excess HCl; it dyes silk a pale golden yellow. *Histidine-bis-azobenzenearsonic acid*, $C_6H_7O_2N_3(N_2C_6H_4AsO_3H_2)_2$, very similar to the tyrosine compd., dyes silk a reddish golden yellow. By boiling with acids it gives off a very little N, with no change in the color of the soln. G. M. MEYER.

Action of bromine upon proteins and amino acids. M. SIEGFRIED AND H. REPPIN. Univ. Leipzig. *Z. physiol. Chem.* **95**, 18–28(1915).—A new way to control the course of hydrolysis of proteins has been sought. It was not attempted to det. the max. amt. of Br taken up, but to use the same conditions throughout. The bromide-bromate soln. was allowed to flow slowly into the soln. studied, 5 cc. 25% HCl added and the mixt. allowed to stand 0.25 hr. at room temp. The KI was added and the soln. titrated back with $Na_2S_2O_3$. The results are given as the quotient N/Br, the ratio of the number of atoms of N to the number of atoms of Br absorbed or substituted. Amino acids without the ring complex, glycocoll, sarcosine, betaine, *dl*-alanine, *dl*,α-aminovalerianic acid, leucine, aspartic acid, glutamic acid, lysine and arginine, do not use any Br. While technical phenylalanine and phenylglycocoll take up large amts., the carefully purified acids do not. The ratio for tyrosine was 0.22, that is, about 5 atoms; tryptophan, 0.26, or 8 atoms Br; histidine, about 1.30, or 2 atoms Br. Before hydrolysis the ratio for gelatin is 15.85, after hydrolysis about 20.4; that is, gelatin uses more Br than the sum of its decompn. products. Witte peptone gave a ratio of 2.15 before, 2.98 after hydrolysis; trypsin fibrin peptone, before 2.96, after 3.60. Peptone, obtained by pepsin digestion from the blood, gave a ratio of 2.67; after hydrolysis 2 days with 12.5% HCl the ratio was 2.96, after 12 days 3.42, after 38 days 4.05. Edestin gave a ratio of 3.20, which became 3.70 after digestion with trypsin for 35 days. G. M. MEYER.

Refractive index of the aqueous humor of animals after treatment with calcium chloride. TRISTAINO. *Arch. optalm.* 1, 111(1914); *Zentr. Biochem. Biophys.* 17, 648(1915); cf. *C. A.* 8, 532.—The value of *n* of the aq. humor of normal rabbits was 1.3335 (for both eyes and at the same period). The value of *n* decreased after subcutaneous injection of $CaCl_2$, the duration and degree of the decrease being dependent to a certain extent upon the amt. of $CaCl_2$ injected; the decrease was the more rapid and more persistent the greater the amt. of $CaCl_2$ injected and the reverse relation was likewise true. H. S. PAINE.

Do chemical rays penetrate the upper eye-lid? SOLGER. *Vgl. Arch. Augenheilk.* (Literaturbericht) 76, 394(1914); *Zentr. Biochem. Biophys.* 17, 649(1915).—A strip of sensitized celluloid film was inserted underneath the upper eye-lid. A distinct gray coloration was observed 35–40 seconds after exposure to light; this indicates that the chem. as well as the optical rays penetrate the eye-lid. H. S. PAINE.

Fibrin reaction which occurs in living cultures of frog tissues. G. A. BAITSELL. *Science* 41, 472(1915).—The transformation of the fibrin net begins at first in the region of the clot which lies in immediate contact with the embedded tissue and gradually extends to the distal regions of the clot until, after a time, practically the entire plasma clot becomes changed into a tissue greatly resembling that found in various types of connective tissues. Expts. prove that the fibers arize by a transformation of the fibrin net, and are not due to any intracellular action. L. W. RIGGS.

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A study of living cells on kinetic and auxetic jellies. J. A. RODDY AND W. D. BAUN. *Pub. Jefferson Med. Coll. and Hosp.* 6, 97–8(1915).—Jellies containing atropine sulfate, morphine, strychnine and pilocarpine nitrate (kinetic jellies) stimulate leucocytes to greater ameboid motility than is ever manifest by cells on plain coefficient jelly. Auxetics were carefully studied and in over 1200 prepns. tried, not one showed self-reproduction of blood cells. R. L. SIBLEY.

The role of enzymes in chemical changes. C. H. MARYOTT. *J. Am. Pharm. Assoc.* 4, 678–82(1915).—There is much evidence that enzymes acting upon substances first form temporary compds. with them. These subsequently break down as the substance changes. The enzyme is set free and immediately forms a new union with other mols. of the substances. The methods by which enzymes are formed and their actions controlled by the cells are not known. M. I. W.

The behavior of enzymes at low temperatures. JOSEPH S. HEPBURN. *J. Am. Pharm. Assoc.* 4, 682–5(1915).—See *C. A.* 9, 1920. M. I. W.

Action of light upon living substance. FRITZ SCHANZ. Dresden. *Arch. ges. Physiol.* 161, 384–96(1915).—The observations of Chalupecky (*Wiener klin. Wochschr.* 1913, No. 31–2; *C. A.* 7, 165, 2800; 8, 756) have been extended to blood proteins. The amt. of albumin present, before and after treating with the light from a quartz lamp for 8 hrs., was 27.0 and 3.9 mg. per 100 cc. strongly diluted serum; the amt. of globulins was 2.1 and 24.2 mg. C. J. WEST.

The autoöxidation of lipoid substances, and concerning several pigments (chromolipoids) and pigment complexes. C. CIACCIO. Univ. Palermo. *Biochem. Z.* 69, 313–33(1915).—C., like Hueck, recognizes 2 classes of fatty pigments, those formed by the union of a lipoid substance with some other pigment such as the pigments obtained from hemoglobin, and those which are more or less changed oxidation products of lipoids. This view is confirmed now by a study of the autoöxidation of unsatd. fats and other substances. The following substances were used: esters of glycerol and cholesterol, fatty acids, soaps, cholesterol, lecithin, cuorin, liver diphosphatide and lipoid complexes extd. directly from the corresponding cell elements. These substances were emulsified in 0.9% NaCl soln. or in Ringer soln. and exposed to the air in thin layers. Special modifications were made to study the influence of light, temp., sterility and addition of various substances. The resulting oxylipoids were compared with the natural fatty pigments as to their microchem. behavior. The process of oxidation is considerably accelerated by Fe, Mn and Mg. The products show a change in color, consistency, solubility, behavior towards acids and alkalies, but not a change in the behavior towards the ordinary lipoid reagents. These properties correspond with those of the so-called fatty pigments of lipofuchsine, found in certain normal and pathogenic cell elements, and they must therefore be considered as the same products. Upon the basis of microchem. properties these oxy- or chromolipoids can be distinguished from other elementary pigment types as well as from pigment complexes; they differ in themselves as to the degree of oxidation and may be divided into 2 groups, depending upon whether they are derived from fatty acids or phosphatides. Those from phosphatides are only slightly colored by Sudan III and Scarlet R and give a negative result with Fischler's test but a positive one with Smith-Dietrich's method after treatment with Cr. The oxylipoids from the fatty acids are characterized by the intense color with Sudan and Scarlet, a positive reaction with Fischler's test, but only after long treatment with Cr with the Smith-Dietrich test. C. believes these chromolipoids to belong to the class of "Abnutzpigmenten" which are capable of further change and which under the proper conditions may serve as oxygen carriers. C. J. WEST.

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The fermentative activity of the blood and the organ tissues after extirpation of the pancreas. II. The nucleases. W. STAWRAKI. Petrograd. *Biochem. Z.* **69**, 363–9(1915).—It is shown that during diseases of the pancreas or disturbances of its inner secretory functions the excretion of endogenous uric acid is decreased while that of the exogenous purines is considerably increased. As would be expected the dog from which the pancreas has been removed shows a considerable decrease of nucleolytic action in the blood and organ tissues. III. Diastase. *Ibid* 370–88. The decrease of the diastatic energy by pancreas extirpation is known; the question as to whether or not the loss is partially or completely replaced by the compensatory activity of some other organ has not been answered. Therefore the amylytic and saccharifying enzymes were detd. at different times and in different organs of dogs from which the pancreas had been removed. The most important decrease occurred 24–48 hrs. after the operation; from the 6th to the 9th days there was a temporary increase; the diastatic activity of the blood was never completely lost. Only in the rump muscles there was an increase, quite marked on the 10th day, and strong after more than 20 days. Entrance of bile into the blood does not influence this decrease of diastatic action.

C. J. WEST.

The phosphatases of malt. LUDWIG ADLER. Weinenstephan. *Biochem. Z.* **70**, 1–36(1915).—There are at least 2 kinds of phosphatases in malt; one of these produces solution of the insol. org. phosphate complexes, while the other forms inorg. phosphates. The reaction is probably step-wise. The temp. optimum for the phosphatases is 58°. An increase of the temp. at once considerably influences their activity while a decrease to 43° is scarcely without effect. The enzyme which produces the solution of the organic phosphates loses its activity after 5 hrs., while the enzyme producing the inorg. phosphates is active for 14 hrs. The activity of the phosphatases depends upon the concn. of the soln., since a large viscosity of the same as well as the heaping up of the reaction products (inorg. phosphate) is harmful. The best decompn. takes place in an ext. of 1 part malt with 20 parts H_2O. In stronger dilns. the formation of the inorg. phosphate is decreased. The H-ion concn. plays the most important part. With $p_H = 5.4$ all the H_3PO_4 of the malt is brought into soln., 93% of which is inorg. in nature. The phosphatases are more sensitive towards HO ions than against the H ions. With a strongly acid reaction ($p_H = 2.0$) an organic compd., phytin, goes into soln. The phosphatases are rather resistant towards treatment with warm alc. The best method of destroying the enzymes is to boil with 85% alc. The malt phosphatases are secretion enzymes, are sol., and work outside the cell. Phytase is one of the principal phosphatases.

C. J. WEST.

Indole from the digestive products of fibrin and casein. W. VON MORACZEWSKI. Zürich. *Biochem. Z.* **70**, 37–40(1915).—Casein and fibrin were digested successively with pepsin, pancreatin and bacteria (human stool), each time for 24 hrs. Ox-blood fibrin and milk casein were used. The fibrin yields products of nearly the same compn., which upon further digestion yield the same amt. of indole. Casein yields caseoses, which, upon digestion, yield more indole than the remaining paranuclein. The caseoses were obtained by filtering the casein after a short pepsin digestion, and coagulating by heating and acidifying with AcOH. This coagulated protein is called caseose I. The filtrate contains caseose II. The undissolved residue after further peptic digestion is paranuclein. In the case of egg albumen the albumoses contain groups yielding more indole than the undigested product.

C. J. WEST.

The chemical nature of several enzymes. TH. BOKORNY. *Biochem. Z.* **70**, 213–51(1915).—The more important results are given: *Diastase* is a yellowish gray powder, nearly insol. in H_2O, only little sol. in *N* NH_4OH or *N* NaOH (the liquid was yellow to red). In the undissolved part obtained by extg. diastase with NH_4OH or

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NaOH, there is found considerable of the base, 10% NH_3 and 1.7% NaOH. Yeast cells bind 15% NH_3 from *N* NH_4OH and over 20% NaOH from *N* NaOH (calcd. on the dry substance of the yeast). Diastase is not sol. in *N* H_2SO_4 and a binding of the acid could not be shown. Under the same conditions the yeast cells bind 13% H_2SO_4. The binding of the bases in the diastase powder is so firm that the diastase-ammonia complex is odorless, does not react alk., and only evolves NH_3 when boiled with $Ca(OH)_2$ or KOH. Diastase is visibly digested by pepsin in the presence of HCl. Upon heating it gives an odor of burnt horn. Methyl violet is absorbed to a marked degree. The powder reacts very faintly alk. towards litmus. *Blood albumin.* This horny mass absorbs 3.74% NH_3 and 6.37% H_2SO_4. It reacts decidedly alk. towards litmus. *Muscle protein.* The white powder absorbs 2.55% NH_3 and 4.9% H_2SO_4 (of its dry wt.); the reaction is slightly acid. *Egg-white protein.* This binds 4.25% of its dry wt. of NH_3 and 6.37% of H_2SO_4. The reaction of the moistened powder towards litmus is slightly alk. *Casein.* The powder reacts very slightly acid towards litmus. It absorbs 3.9% of NH_3 and 10.78% H_2SO_4. *Takadiastase.* This binds 3.74% of its dry wt. of NH_3. It reacts slightly alk. towards litmus. *Pepsin.* The yellow powder is entirely sol. in H_2O and in *N* NH_4OH. No binding of acids or bases could be shown. The reaction is considerably acid, the taste bitter but sweet. *Trypsin (old prepn.).* Binds 3.74% NH_3 and 5.88% H_2SO_4. Reaction, neutral. *Fresh trypsin.* Binds 3.4% NH_3 and 1.96% H_2SO_4. Reaction, neutral. It is little sol. in H_2O or *N* H_2SO_4 but 1 g. dissolves easily in 10 cc. *N* NH_4OH. *Rennet* (powder). Binds 3.4% NH_3 and 2.94% H_2SO_4 from *N* solns. It reacts acid towards litmus, somewhat sol. in H_2O, easily sol. in *N* NH_4OH. *Emulsin.* Binds 4.25% NH_3 and 7.35% H_2SO_4 from *N* solns. Difficultly sol. in H_2O, somewhat sol. in NH_3 with a brownish color, insol. in H_2SO_4, reaction, somewhat acid. These facts do not point to a similarity or identity of pepsin and rennet. The capacity to bind both acids and bases speaks for the protein nature of the enzymes. The fact that an enzyme does not bind acids and bases does not argue against the protein nature, as there are certain protein substances which lack this property. It is not improbable that the size of the mol. has something to do with this capacity. Cf. *C. A.* 9, 2548. C. J. West.

Proteolytic action of protein decomposition products. Proteolysis with trypsin dialysate, action of alkali gallates, conditions for protein solubility. E. Herzfeld. Univ. Zürich. *Biochem. Z.* 70, 262–8(1915).—Upon dialysis the active part of the trypsin goes into the dialysate. The colloidal residue remaining in the dialysis shell is nearly inactive, because of the removal of the substances reacting with ninhydrin. The aliphatic amino acids have a stronger decomposing action than the aromatic acids. This action is especially marked in the case of Na glycocollate and a mixt. of the alkali gallates. For the soln. of protein coagula there must be first a partial decompn. The more decompn. products present the more insol. protein goes into soln. The coagulable proteins contain only small amts. of decompn. products while the non-coagulable ones contain more of the decompn. products and less colloidal protein.
C. J. West.

Protein compounds. I. Can a complete hydrolysis of proteins be brought about by pepsin, trypsin and erepsin? A. C. Anderson. Copenhagen. *Biochem. Z.* 70, 344–67(1915).—It is shown that it is very difficult if not impossible completely to hydrolyze animal proteins by means of enzymes. The completely hydrolyzed product obtained by the action of acids contains, besides amino acids, considerable quantities of NH_3. The formol titration gives a higher content of amino N in the digestion products of amino acids than does the Van Slyke method. **II. The linking of ammonia in the protein compounds.** A. C. Anderson and Regitze Roed-Müller. *Ibid* 442–63. Part of the NH_3 is bound as amide N. The expts. reported seem to indicate

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that a second part is present in the protein mol. as uramido acids. A positive proof of this has not been established, the actual isolation of such acids being necessary for this. Since these acids are not decompd. by enzymes, the product obtained upon hydrolysis with enzymes should form a suitable source for these acids. It is probable that the NH_3 is bound in such a form that the N is not split off by the enzymes of the digestive tract unless bacteria or unknown enzymes play a part. C. J. WEST.

Physical condition of colloids. XIX. Neutral salt protein compounds. THADDÄUS ORYNG AND WOLFGANG PAULI. Univ. Vienna. *Biochem. Z.* 70, 368–97(1915).—The amt. of bound Cl in dialyzed serum is considerably increased by the addition of KCl soln. This amt. may be varied by increasing either the concn. of the salt soln. or of the serum. Addition of H_2SO_4 causes a large increase in the amt. of bound Cl. NaOH has little effect. Neutral salts ($NaNO_3$) have a slight increasing effect. Similar observations were made for albumin, glutin and desaminoglutin. Glycocoll binds considerable Cl from a KCl soln. Urea does not react in this way. All measurements of Cl ion were made electrometrically. **XX. General chemistry of the caseinates.** I. WOLFGANG PAULI. *Ibid* 489–503. Values are given for the viscosity, elec. cond. and f. p. of various alk. solns. of casein. C. J. WEST.

Action of penetrating radium rays upon inorganic and bio-colloids. I. A. FERNAU AND W. PAULI. Univ. Vienna. *Biochem. Z.* 70, 426–41(1915).—Colloidal $Fe(OH)_3$ became turbid through the action of the Ra rays. Cerium hydroxide showed at first a slight decrease of the internal friction; this slowly and then much more rapidly rose to a value many times the original. The presence of H_2O_2 had no influence upon the action. No effect was found upon colloidal gold and upon molybdenum blue. As_2O_3 and Sb_2O_3 became turbid and S was pptd. V_2O_5 showed a very slight increase in internal friction, probably due to the action of H_2O_2. Colloidal protein was coagulated. The electrolyte content has much to do with the stability of these solns. The action of the rays upon native protein causes an irreversible change finally leading to coagulation. It resembles in many respects the coagulation by heat, alc., phenol and concd. salt solns. The effects are being further studied. C. J. WEST.

Hydration of the protein ion. WO. PAULI. Univ. Vienna. *Biochem. Z.* 70, 504(1915).—P. claims that the hydration of the protein ion was first suggested by himself and not Laqueur and Sackur or Hardy as given by Michaelis in his book, "Die Wasserstoffionkonzentration." C. J. WEST.

The action of arginase on creatine. III. ANTONINO CLEMENTI. Univ. Rome. *Atti accad. Lincei* 24, I, 483–9(1915).—By earlier work it was shown that arginase is of primary importance among the ferments of living organisms. One of the most important questions in this connection is the question of the specific action of arginase and in order to settle this it is necessary to learn whether arginase is capable of detaching the guanidine nucleus from the mol. of various organic compds. or if it only detaches the guanidine mol. from arginine. If arginase is a general deguanidinizing ferment it should be able also to act on creatine (*a*), glycocyamine (*b*), and glycocyamylglycine (*c*). By the action of arginase on arginine + H_2O ornithine + urea are formed. Similarly (*a*) + H_2O should give sarcosine + urea, (*b*) glycine + urea and (*c*) glycylglycine + urea when treated with arginase. The present paper deals with the action of arginase on creatine. This is of biological importance since, after arginine, creatine is most important as a source of urea arizing by hydrolysis. It has been shown that creatine represents a very characteristic product of N metabolism in the organism along with urea and uric acid. Further, creatine is not present as such in the protein mol., so that it is derived from other structural parts of the protein mol. or of the cellular protoplasm, which are broken down during metabolism. Pekelharing and

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van Hoogenhuyze [J. A. S. 1456] found that creatine is a typical final product of the metabolism of the muscle cells and that it is important in the toxic activity of the muscle fiber. Embden has found that arginase has no action on creatine. Since Abderhalden has proposed the name dephosphinase for arginase it seemed important to repeat these expts. The amt. of hydrolysis was measured by the Sörensen CH_2O titration in which arginine behaves as a monoamino acid and creatine as a neutral compd. A fresh aq. ext. of dog liver was mixed with a 0.05 *N* soln. of creatine and kept in a thermostat at 37° after adding toluene. The results showed: 1. That, as stated by Dakin, the hydrolysis of creatine by arginase does not take place. 2. Arginase is not a ferment capable of detaching the guanidine nucleus from any compd. to which it is bound as would be indicated by the name dephosphinase proposed recently for arginase by Abderhalden. 3. The stability of arginine in hydrolyzing creatine favors the idea of the specificity of this ferment. E. J. Witzemann.

The action of peptolytic ferments on the polypeptides. Antonio Clementi. Univ. Rome. *Atti accad. Lincei* [5] 24, I, 916-26 (1915).—After briefly reviewing the literature on the polypeptides C. states that the biological demonstration that the amino acids are bound in the protein mol. in a way analogous to that in which they are bound in the polypeptide mol. has been accomplished in 2 ways: 1. the chem. isolation from the products of hydrolysis of proteins of polypeptides of which the synthesis had previously been accomplished by chem. means; 2. the analogy existing between the manner in which they act on the protein mol. The method originally used by Fischer and Bergell in 1. was essentially chem. Later Abderhalden and Kaelber *Z. physiol. Chem.* 52, 208 (1907) used an optical method and Hans Euler *Z. physik. Chem.* 51 (1905) used an electrometric method. These methods are not quant. Since the amino acids are united in the polypeptide mol. in the NH_2 group and since their fermentative decomp. causes a regeneration of COOH groups and NH_2 groups thus: $RCONHR - H_2O \longrightarrow RCOOH - NH_2R$, it is evident, by detg. the free NH_2 groups first of the polypeptides and then after the action of peptolytic ferments, that the action of the peptolytic ferments can be detd. The method adopted was the formol titration method of Sörensen [*Ann. chim. phys.* [7] 12, 469 (1907)] which has been used to det. the free NH_2 groups in polypeptides (Abderhalden, Van Slyke, *Z. physiol. Chem.* 74; Abderhalden, Hasiam, *Z. physiol. Chem.* 77) but not in measuring the amt. of hydrolysis. Sörensen studied the action of formol on glycocoll anhydrides and on glycylglycine and found that the former behaves as a neutral compd. C. expects to extend these expts., but from the present series concludes: 1. that the formaldehyde titration for free amino groups in polypeptides and their hydrolytic products is a method practically adapted to the study of the action of peptolytic ferments on polypeptides; (2) this method has the advantage over Fischer's method of being capable of being used for any small amt. of polypeptide; it has the advantage over Abderhalden's optical method of being available for use with polypeptides of optically inactive amino acids; it has the advantage of rapidity of detn. over the electrometric method of Euler; it is superior to all previous methods in being rigorously quantitative. 3. By applying this method of titration it was found that d-leucylglycine is not hydrolyzed by pancreatic juice, while by the action of the peptolytic ferments of liver tissue 0.5 of the amt. used was hydrolyzed. This is the first quant. expt. result in favor of the principle of asymmetric action of peptolytic ferments in the organism on racemic polypeptides. E. J. Witzemann.

Hydration and "solution" in gelatin. Fischer 2. **Hemocellulase in malt** (Winbush Leitner 16. **The relation of the oxygen tension of the atmosphere to combustion.** Dalling 2.

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B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

Determination of the urea and the extractive substances of the urine by the xanthydrol method. L. MAESTRO. Florence. *Arch. farm. sper.* 19, 572–6(1915).—The method of Fosse as modified by M. is as follows: 1 cc. of urine is pipetted into a 50 cc. Erlenmeyer flask, 9 cc. H_2O added and 20 cc. glacial AcOH. To this is added 5 cc. of a 6% soln. of xanthydrol in glacial AcOH, in 5 portions of 1 cc. each at intervals of 10 min. The reaction is complete after standing an hour. The ppt. is collected on a tared filter, washed with a few drops of MeOH, dried and weighed. Multiplying the wt. of ppt. by the factor 142.857 gives the amt. of urea per liter of urine. A. W. DOX.

Estimation of acidity. I. TRAUBE AND R. SOMOGYI. *Intern. Z. phys. chem. Biol.* 1, 479–84(1914); *J. Chem. Soc.* 108, II, 101.—This is a new method based on the observation that the addition of a strong capillary-inactive acid (a strong acid which, on dissolving in water, does not lower the surface tension of the solvent) to the capillary-inactive salt of a weaker capillary-active acid sets free the weak capillary-active acid and causes a lowering of the surface tension, from which the quantity of strong acid added can be calcd. The capillary-inactive salt chosen was Na isovalerate, and the method was to mix 5 cc. of a 2% soln. of this salt with 0.2 cc. of serum or other fluid and measure the lowering of surface tension by the viscostagonometer at 23°. H. D.

Preparation of tetanus antitoxin. E. H. RUEDIGER. *Philippine J. Sci.* (*B*) 10, 31–63(1915).—A number of horses were first immunized by being given varying amts. of tetanus antitoxin. Then toxin was injected in gradually increasing amts., blood being drawn from time to time. The serum in some cases contained as much as 600 units of tetanus antitoxin per cc. The production of antitoxin reaches its highest mark in from 6 to 9 months after the beginning of immunization. The dosage of toxin should be such that the horse does not appreciably lose in weight. H. D.

Guaiacum resin as reagent for detection of oxidases and minute traces of copper. W. R. G. ATKINS. *Proc. Chem. Soc.* 29, 303(1913).—Very minute amts. of Cu salts or of $KMnO_4$ may be detected by this test. Limits of sensitiveness of the reaction expressed in g. per cc., are as follows: Cu as sulfate, 2×10^{-9} to 2×10^{-8}; $KMnO_4$, 4×10^{-8}; $K_2Cr_2O_7$, 1×10^{-7}; Fe as $FeSO_4$, 1×10^{-6}, as $Fe_2(SO_4)_3$, 1×10^{-6}; Pb acetate, 6×10^{-6}; $MnSO_4$, 8×10^{-4}. In making the test, a few drops of H_2O_2 were added with a very dil. soln. of the reagent. H. DUBIN.

Methods adopted in the estimation of nitrogenous constituents of extracts derived from albuminous substances, such as meat extracts and similar products, with special references to the interpretation of the results. *Analyst* 40, 310–26(1915).—A review. P. B. DUNBAR.

An apparatus for the quantitative collection of urine from women. OTTO FOLIN AND W. DENIS. Harvard Med. School. *Arch. Intern. Med.* 16, 195–6(1915).—Description of a divided bed-pan. I. GREENWALD.

A simple method for determining variations in the hydrogen ion concentration of the blood. R. L. LEVY, L. G. ROWNTREE AND W. MCKIM MARRIOTT. Johns Hopkins Hosp. *Arch. Intern. Med.* 16, 389–405(1915).—Three cc. of blood or serum are run into a celloidin bag and dialyzed for 5–10 min. against 3 cc. of 0.8% NaCl. After adding 5 drops of 0.01% phenolphthalein to the dialysate, the color is compared with that of a permanent series of standards prepared from Na phosphate solns. and the same amt. of phenolphthalein. The values of p_H found were: in normal oxalated blood 7.4–7.6, in serum 7.6–7.8. In cases of clinical acidosis values as high as 7.2, and in experimental acidosis as high as 6.9, were observed. I. GREENWALD.

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The use of aluminium hydroxide cream for the removal of albumin in nitrogen partition in urinary analysis. GROVER TRACY AND WILLIAM H. WELKER. Univ. Ill. *J. Biol. Chem.* **22**, 55–7(1915).—Alumina cream, prepd. by adding a slight excess of 1% NH_4OH to a 1% soln. of NH_3-alum and washing by decantation, has the property of absorbing colloids, including albumin. T. and W. recommend its use in freeing urine of albumin. An equal vol. of alumina cream is sufficient to remove all the albumin from urines containing no more than 1%. I. GREENWALD.

On the estimation of non-protein nitrogen and glucose in finger blood. ALONZO E. TAYLOR AND FLORENCE HULTON. Univ. Penna. *J. Biol. Chem.* **22**, 63–9(1915).—The Folin method is modified as follows: Blood is obtained by finger puncture and is allowed to drop directly into a tared flask containing 10 cc. of a mixt. of 3 parts abs. EtOH and 1 part Et_2O. From 0.2 to 0.5 g. of blood are used. The flask is shaken after the addition of each drop and about 30 min. later the mixt. is filtered into a 25 cc. long-necked Kjeldahl flask. The ppt. is washed with 5 cc. of the EtOH-Et_2O mixt. A little $KHSO_4$ and a few glass beads are added and the Et_2O and EtOH distd. off. Then 1 cc. concd. H_2SO_4 and not more than 300 to 400 mg. K_2SO_4 are added and the oxidation completed without the use of a catalyzer. The mixt. is then transferred to a 100 cc. vol. flask, 3 cc. of 30% NaOH added, dild. to about 75 cc., then 5 cc. of a Nessler-Winkler soln. added and the mixt. dild. to 100 cc. The standard is similarly prepd. and contains 0.0002 g. N. Duplicates may differ by as much as 3 or 5 mg. per 100 cc. of blood but the results are regarded as sufficiently accurate for many purposes. *Glucose.* A number of sources of error in the Bang method are pointed out and refinements of technic suggested. The importance of frequent blank detns. is emphasized. T. and H. believe that the normal amt. of blood sugar is from 0.050 to 0.150 g. per 100 cc. of blood. I. GREENWALD.

A method for the determination of "lecithin" in small amounts of blood. W. R. BLOOR. Harvard Med. School. *J. Biol. Chem.* **22**, 133–49(1915).—Three cc. of blood are slowly run into a 100 cc. flask containing 70–80 cc. of a mixt. of 3 parts EtOH and 1 part Et_2O, shaking constantly. The mixt. is slowly heated to boiling in a H_2O-bath, cooled and dild. to vol. with the EtOH-Et_2O mixt. From 10 to 25 cc. of this ext. are measured into a 200 × 25 mm. Jena test tube, 2 or 3 small glass beads are added and the soln. evapd. to dryness in a H_2O-bath and heated for 15 min. after apparently dry. 1.5 cc. of a mixt. of equal parts of concd. H_2SO_4 and HNO_3 are added and the tube gently heated until no more red fumes are evolved. The HNO_3 is then completely driven off and the H_2SO_4 boiled for 8 to 10 min. After cooling somewhat, 2 drops 0.25% sucrose soln. are added and the mixt. heated for 1 min. (This is to remove traces of HNO_3 combined with H_3PO_4, interfering with its pptn.) After cooling, add 3 cc. H_2O, 1 drop 0.3% phenolph. and 20% NaOH (Cl-free) until neutral (note amt. used), then 0.5 *N* H_2SO_4 until acid and 0.1 *N* NaOH until just alk. One cc. 10% $(NH_4)_2SO_4$ and 1.5 cc. 0.1 *N* NaOH are added and the mixt. dild. to 10 cc. (approx.). The standard is prepared in a similar tube from 3 cc. phosphate soln. containing 0.15 mg. H_3PO_4, 1 drop phenolphthalein, the amt. of 20% NaOH soln. used in the test soln., concd. H_2SO_4 to neutralize this, the mixt. adjusted to exact neutrality and $(NH_4)_2SO_4$ and NaOH added as above. Into each of two 25 cc. vol. flasks are measured 10 cc. of 1.5% neutralized $AgNO_3$ soln. and the standard and test solns. are added through funnels so that the 10 cc. are delivered in 15 seconds. The liquid in the flask is gently rotated during the addition and the tube is rinsed out with H_2O, also added through the funnel. The mixts. in the flasks are then dild. to the mark, well shaken and compared in the nephelometer. Within 25% of the standard, the readings are inversely proportional to the amt. of H_3PO_4 present. For larger differences the instrument should be calibrated, but if these are much greater, com-

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parison is very difficult. Known phosphate solns. may be analyzed with an accuracy of about 2% but in the detn. of blood lecithin the accuracy is about 5%.

I. GREENWALD.

The determination of iodine in the presence of organic matter. ROBERT B. KRAUSS. Univ. Penna. *J. Biol. Chem.* **22**, 151–7(1915).—An amt. of material containing from 0.1 to 10 mg. I is mixed in a Ni crucible with 8 g. of a mixt. of equimol. parts of Na_2CO_3, K_2CO_3 and KNO_3 and covered with 5 g. of the same mixt. After complete fusion and cooling, the mixt. is dissolved in hot H_2O, transferred to a 200 cc. Erlenmeyer flask, 2 cc. 10% $NaHSO_3$ added and then 85% H_3PO_4 until slightly acid. The liquid is then made slightly alk. with Na_2CO_3 and evapd. on a hot plate until it just remains liquid on cooling. When cold, 20 cc. of Me_2CO are added and the flask shaken. The extn. of the iodides is completed with small portions of abs. EtOH and the exts. are filtered into a 100 cc. Nessler tube. To this a soln. of $PdCl_2$ (0.0005 g. per cc.) in a little HCl is added, drop by drop, until the color no longer deepens. A series of standards containing about the same amts. of Me_2CO, EtOH and H_2O are prepared and the colors compared after standing 5 min. A difference of 0.01 mg. I may be detected and for further accuracy the colors may be compared in a colorimeter. I. G.

The quantitative determination of the total protein and non-protein substances of muscle. N. W. JANNEY AND F. A. CSONKA. Montefiore Home, New York. *J. Biol. Chem.* **22**, 195–201(1915).—*Total solids.* One gram of the hashed muscle is weighed into a weighing bottle and dried *in vacuo* at room temp. for 24 hrs. and for ten at 55–65°. *Non-protein constituents.* About 10 g. of the hashed muscle is weighed into a 400 cc. beaker. After adding 100 cc. H_2O and 5 cc. 10% NaCl soln., the mixt. is heated to 90°. If necessary, not more than 20 drops of 0.5 *N* HOAc are added. The liquid is filtered through a 12.5 cm. paper, previously extd. with EtOH, Et_2O, dried and weighed, and the residue extd. 3 times with 100 cc. hot H_2O. The filtrate should be clear or only slightly opalescent. The filter is then carefully folded about the protein ppt., inserted in an extn. thimble and extd. in a Soxhlet for 12 hrs. with 95% EtOH, 6 hrs. with abs. EtOH and 6 hrs. with Et_2O. The paper and enclosed material are then removed, dried at 110° and weighed. The material thus obtained contains 0.1 to 0.4% ash, 0.5 to 1.3% fat (detd. by a sapon. method, *C. A.* **9**, 329) and no carbohydrate.

I. GREENWALD.

A micro-refractometric method of determining the percentages of globulin and albumin in very small quantities of blood serum. T. B. ROBERTSON. Univ. Calif. *J. Biol. Chem.* **22**, 233–9(1915).—*Non-protein constituents.* Glass tubes 25 cm. long, internal diam. 5 mm. and with walls 1 mm. thick are sealed at 1 end. Into 1 of these, introduce 1 cc. of serum from a bacteriological pipet reading to 0.01 cc., avoiding wetting the upper end of the tube. Clean the pipet and then use it to add 1 cc. 0.04 *N* HOAc. After adding a piece of Ag or Pt wire about 1.5 mm. in diam. seal the tube. After cooling, shake and immerse in a beaker of cold H_2O, heat to boiling for 1–2 min. and remove the tube. When cool, break tube, break up coagulum, centrifuge and det. n for liquid and for 0.02 *N* HOAc. The difference multiplied by 2 is the refractivity of the non-protein constituents. The percentage of non-protein constituents in the serum is obtained by dividing this by 0.00160. *Albumins.* Tubes such as used above but only 9–10 cm. long are used with glass stoppers (made from glass tubing) held in place with rubber tubing. Into 1 of these introduce 0.5 cc. satd. $(NH_4)_2SO_4$ soln., 0.5 cc. serum (this order is important) and a piece of wire and then shake. Centrifugate and remove the liquid with a pipet. Enough is obtained to fill the lower part of a pipet and 0.25 cc. more. This quantity is measured into another tube and there mixed with 0.25 cc. H_2O. n is then detd. in this liquid and in 0.25 satd. $(NH_4)_2SO_4$. The difference multiplied by 4 is the refractivity due to the albumins. This divided

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by 0.00177 equals the percentage of albumins in the serum. *Globulins.* *n* is detd. for the serum and for H_2O. From the difference subtract the value for the refractivity of the non-protein constituents and the albumins. The difference is the refractivity of the globulins and when divided by 0.00229 yields the percentage of globulins in the serum. With a Pulfrich refractometer reading to 1′, the errors are estd. to be, albumin ±0.2%, globulin ±0.15%, non-protein constituents ±0.1%. I. GREENWALD.

New form of nephelometer. J. T. W. MARSHALL AND H. W. BANKS, 3RD. Roosevelt Hospital, N. Y. City. *Proc. Am. Phil. Soc.* 54, 176–84(1915).—In previous nephelometers measurements have been made by a series of approximations, standard solns. being prepd. until one was obtained of the same concn. as the sample. Further, the light from the tubes has been equalized by changing the length of the illuminated columns of suspended material. This method introduces error due to the fact that the amt. of light reflected is reduced by an amt. depending upon the light absorbed by the liquid above the particle. In the present instrument the columns are of equal length and the light is actually measured by photometric methods. Two cylindrical glass cells, 4 cm. high and 1 cm. in diam., rest on a shelf and are illuminated, normally to their axes, by parallel light from a 100 watt lamp. Rays reflected parallel to the tube axis from the suspended particles pass up the cells and are reflected from mirrors, inclined at an angle of 45°, into an eye-piece. An annular ring is cleaned from one mirror so that the light from one cell passes through the opening while the light from the other cell is reflected from the silvered part; with the eye-piece focused on this mirror the fields are easily compared. Photometric balance is obtained by varying the light from one cell by means of a movable wedge of neutral-tinted glass between the cell and mirror. The amt. of motion is measurable with scale and vernier. Black fiber caps and dead black paint prevent stray light from reaching the eye-piece. Some expts. were made with an instrument similar to the above on the detn. of albumin in urine. The instrument used differed from the one described mainly in the substitution of a tapered slot for the glass wedge. Standard solns. were prepd. from fresh normal human serum as recommended by Folin and Denis, standardized both by N and by gravimetric detns. of heat coagulable proteins. Results showed that the detn. of albumin with the nephelometer gave results considerably higher than gravimetric detns. made according to Sherer's method. With one patient results were consistently 25% higher, with another variable from 1.0 to 1.5%. It is suggested that the various proteins of the serum give clouds of different intensities. To test this point albumin, euglobulin, and pseudoglobulin were prepd. under identical conditions by pptn. with sulfosalicylic acid from horse serum. The albumin gave about $2^1/_2$ times as great opalescence as the euglobulin and 3 times as great as pseudoglobulin. Compared with casein suspensions, the following ratios, expressing the light-reflecting power of equal amts. of these proteins, were found: casein = 0.67 albumin, euglobulin = 0.63 casein, pseudoglobulin = 0.51 casein. Thus the nephelometric comparison of urine with any definite standard, such as serum, cannot give a detn. of the total proteins. It is hoped by the use of specific precipitants to apply the method to the separate detn. of albumin and globulin in urine. F. A. HARVEY.

Calorimetric calibration of the Krogh bicycle ergometer. F. G. BENEDICT AND L. E. EMMES. *Am. J. Physiol.* 38, 52–61(1915).—A Krogh bicycle ergograph (*C. A.* 8, 1595) placed inside a calorimeter was rotated by means of an elec. motor on the outside. The heat produced was measured directly and corrections made for that developed in the magnetic fields and by a small elec. fan used to equalize temp. inside the calorimeter. Work done was detd. directly. Using 426.6 kg. as equiv. to 1 Cal., the results obtained agree with the theoretical within 0.5%. Friction and other extraneous factors may be entirely neglected. J. F. LYMAN.

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Hydrogen electrodes and rapid methods of determining hydrogen ion concentration. J. F. McCLENDON. *Am. J. Physiol.* **38**, 180–5(1915).—The electrode devized by Michaelis is modified to reduce the time required for the detn. of H^+ conc. from 40 min. to 2 or 3 min. Electrodes suitable for detg. H^+ conc. of blood and one which may be lowered into the stomach are described. J. F. LYMAN.

A new indole reaction. OSKAR BAUDISCH. Vienna. *Z. physiol. Chem.* **94**, 132–5(1915).—The cultures are grown on agar containing a little nitromethane for 8–16 hrs. Dil. alkali is added, the mixt. heated, cooled, 1 cc. $C_5H_{11}OH$ added, the whole shaken, excess HCl added and the mixt. again brought to a boil. If the colonies have produced even a small amt. of indole, the alc. layer is red or rose color. The intensity depends upon the indole content. If the agar does not contain nitromethane a few drops may be added to the alk. soln. G. M. MEYER.

Pepsin estimation. L. J. GESELSCHAP. Univ. Utrecht. *Dissertation, Utrecht* 1915; *Z. physiol. Chem.* **94**, 205–26(1915).—A careful study of the methods of Mett, Grützner, Volhard and Fuld-Levison for detg. pepsin has been made. The method of Mett and that of Grützner furnish a means of detg. pepsin with sufficient accuracy. If the activity of the stomach juices is very weak or if a very rapid method is desired, Grützner's method should be used. The stomach mucous membrane of the hog is a suitable source of pepsin; if properly prepd., it may be used as a standard for a long time. G. M. MEYER.

Isolation of typhoid and paratyphoid bacilli from the feces. C. H. BROWNING AND L. H. D. THORNTON. *Brit. Med. J.* 1915, II, 248–50.—The authors use, as a selective medium, faintly alkaline peptone-water containing brilliant green in varying proportions. To suppress inositol fermenters, telluric acid is added. A. H. R.

Thermo-couple thermometer. ARTHUR F. HOLDING. *Med. Record* **88**, 267–70 (1915).—The weak point in coagulation in the surgery of malignant tumors has been the impossibility of applying the principles of selective temps. For this purpose H. employs a thermometer whose action depends upon a constantin-Cu couple. The app. is an application of the appliance used in physiological calorimetry. A. H. RAHE.

Volumetric determination of the sulfates in the urine. ALWIN KNAUER AND BENJAMIN HOROWITZ. *Med. Record* **88**, 388–9(1915).—In the detn. of total sulfates, 50 cc. urine and 5 cc. HCl (sp. gr. 1.2) are boiled in an Erlenmeyer flask for 10 min., $BaCl_2$ soln. (1 cc. = 0.005 g. H_2SO_4) added to the amt. of 10 or 15 cc. and the boiling continued for 4 min. Not more than 1 cc. of the soln. is filtered into each of 3 tubes of the same diam. One tube is kept as a control; to another 3 drops of the $BaCl_2$ are added and to the third 3 drops of K_2SO_4 (1 cc. = 1 cc. $BaCl_2$). If too little $BaCl_2$ has been added, the second tube will be clouded, but if this salt is present in excess the cloudiness will appear in the third tube. The contents of the tubes are restored to the main soln., the test tubes and filter washed with distd. water, 1 cc. of $BaCl_2$ or K_2SO_4 depending upon which is in excess is now added and the test repeated. If in the first trial the second tube became cloudy and continued so after the addition of another cc. of $BaCl_2$, whereas the third tube was clear or less cloudy than the second, an excess of SO_4 ions is indicated and more $BaCl_2$ is required. When the reverse is the case (the second tube clear or slightly cloudy and the third strongly clouded) the Ba ions are in excess and more K_2SO_4 is required. When a reaction is obtained that is the reverse of the one preceding it the end point lies between the two and if only an approximation is required an average is taken. For accurate work, reduced amts. of the reagents are added to the test tubes until a point is reached at which 3 drops of one soln. cause a cloudiness equal to that caused by an equal amt. of the other. The inorganic sulfate

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is detd. in the same way, substituting AcOH for HCl. The soln. must not be heated. *Neutral sulfur.* To 50 cc. of urine 5 g. KNO_3 and 7 g. Na_2CO_3 are added, the mixt. evapd. and the carbonaceous matter oxidized by heat. The residue is dissolved in water, poured into an Erlenmeyer flask and 5 cc. HCl added. The total sulfates detn. is then made as directed above. The difference between this value and those obtained in the detns. of the inorganic and ethereal sulfates will be the neutral S.

A. H. RAHE.

Benzidine tablet test for occult blood. DUDLEY ROBERTS. Brooklyn. *J. Am. Med. Assoc.* 65, 244(1915).—One part of benzidine to 20 parts of Na perborate are triturated and made into 0.32 g. (5 grain) tablets. A thin layer of the liquid to be tested is placed in a porcelain dish and a tablet added in a manner to be thoroughly wet but not immersed in the liquid; a drop or two of glacial AcOH on the tablet gives a greenish blue color if blood is present. L. W. RIGGS.

A new pocket colorimeter. THEODORE KUTTNER. New York. *J. Am. Med. Assoc.* 65, 245(1915).—An illustrated description of the instrument is given.

L. W. RIGGS.

Estimation of carbon dioxide tension in alveolar air. PAUL ROTH. Battle Creek. *J. Am. Med. Assoc.* 65, 413–8(1915); cf. *C. A.* 8, 1970, 1983, 2414.—R. confirms the work of Henderson that the detn. of the CO_2 tension in alveolar air is the best method for recognizing and measuring the intensity of acidosis. R.'s methods of obtaining samples of alveolar air are described at length. L. W. RIGGS.

Comparative analysis of several peptones. R. C. COLWELL. *Science* 41, 662 (1915).—Four brands were analyzed to det. the advisability of substituting an American brand for Witte's in standard methods of bacteriological analysis. Peptones containing lactose seem to be inferior for making culture media to those free from lactose.

L. W. RIGGS.

New method for precipitating cellulose for cellulose agar. F. M. SCALES. *Science* 41, 662–3(1915).—One hundred cc. of concd. H_2SO_4 are dild. with 60 cc. of H_2O in a 2-liter flask and cooled to about 60°; 5 g. of filter paper are moistened, added to the acid and agitated until the cellulose is dissolved; the flask is then immediately filled with cold tap water, the resulting ppt. filtered and washed free of acid. The pptd. cellulose is then made up to 500 cc. with water when it may be added to 500 cc. of a 1% agar soln. containing the nutrient salts. L. W. RIGGS.

Nephelometric estimation of purine bases, including uric acid, in urine and blood. SARA S. GRAVES AND PHILIP A. KOBER. *J. Am. Chem. Soc.* 37, 2430–47(1915); cf. *C. A.* 8, 2733.—The nephelometric precipitant finally adopted as suitable consists of 50 cc. of NH_3-$AgNO_3$ (26.0 g. $AgNO_3$ per l. with 26–7 cc. of NH_4OH of d. 0.90), 8 cc. of NH_4Cl (16.5 g. in 100 cc.), enough NH_4OH to redissolve pptd. AgCl (usually 9 cc. of d. 0.90), an excess of 5 cc. of NH_4OH (d. 0.90), and H_2O to 100 cc.; if well stoppered, the reagent keeps indefinitely. To keep the ppt. in suspension long enough for the readings (7–30 min.) albumin from old (cold storage) eggs in dil. soln. is efficient. To sep. the uric acid, the washed MnO_2 pptd. by treating 25 g. $KMnO_4$ in 500 cc. boiling H_2O with 95% alc. until decolorized is suspended in 500 cc. H_2O; to 10 cc. of the neutralized soln. of uric acid and purine bases containing about 0.001 g. substance are added 0.1 cc. of 6% NH_4OH and 1 cc. MnO_2 suspension: after 3–4 min. standing with frequent shaking, the mixt. is filtered until clear and the purine bases detd. nephelometrically. To det. the uric acid and the other purine bases separately, the total purine content must first be detd. with enough albumin to prevent flocculation (that required for an equiv. amt. of uric acid) and the purine bases must then be estimated separately without the uric acid with the smallest amt. of albumin that will give the desired protective

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action, for in the presence of uric acid the other purine bases are thrown down quant. even when the albumin is 10 times too strong for the purine bases alone. The correct amt. of albumin can easily be detd. by adding 3 or 4 different strengths of albumin and comparing, after pptn., with a standard in a nephelometer, that which gives the heaviest cloud being the correct concn. A mixt. of 5 cc. urine and 5 cc. reagent is centrifuged 1–3 min., the supernatant liquid poured off, 10 cc. of 1:100 HCl added, the mixt. heated 2–5 min. in boiling H_2O, cooled, made up to 15 cc., centrifuged or allowed to settle and the soln. (*a*) pipetted off. To det. the total purines, to 3 cc. (*a*) are added 7 cc. H_2O, 10 cc. of 2% albumin, 0.05–0.10 cc. NH_4OH (d. 0.90) and 10 cc. reagent and the suspension compared with a standard. To det. the purines less the uric acid, to 10 cc. (*a*) are added 2 cc. of 1% Li_2CO_3 satd. with H_2S, 2 cc. Li_2CO_3 and 2 cc. MnO_2 suspension, the mixt. is allowed to stand 3–5 min. with occasional shaking, filtered until clear and 10 cc. of the filtrate pptd. with 5 cc. of the reagent and detd. nephelometrically. The method gave an av. of 0.646 g. uric acid per l. as compared with 0.578 g. by the Folin and Denis colorimetric method. In working with blood, 5 vols. of 3% sulfosalicylic acid or of Greenwald's reagent (5%) have proved very satisfactory in removing the protein; the latter has the advantage of not producing a yellow color with the NH_3 of the purine precipitant, so that the purines can be detd. directly in the filtrates after centrifuging off the Ca as oxalate. CHAS. A. ROUILLER.

Estimation of sugar in urine by Bang's method. WM. GRAY. *J. Am. Pharm. Assoc.* 4, 740–1(1915).—The prepn. of Bang's soln., the application of the test and a reproduction of a table of reduction equivalents are given. M. I. W.

A hydrosaccharimeter. ALFRED STEPHAN. Wiesbaden. *Schweiz. Apoth. Ztg.* 53, 371–4(1915).—This instrument dets. the amt. of sugar in urine by fermentation and reading the vol. of CO_2 against a H_2O column. It is a U tube, one arm of which is graduated downward from 0 to 15 cc. in 0.1 cc. Its upper end is somewhat wider to receive the small fermenting glass, and closed with a hollow, ground-glass stopper which has a lateral perforation. This communicates with the outer air through a hole in the U tube at a certain position of the stopper. The fermenting glass receives 1 cc. of urine, and a pea-sized pellet of compressed yeast. The U tube contains H_2O to about the zero mark, and 1 cc. of olive oil on the side of the scale to prevent absorption of CO_2 by H_2O. Insert the fermenting glass and adjust the top of the oil to the zero mark, then turn the stopper. When fermentation is completed, bring the liquids to a level, read vol. and temp. and find % of sugar from a given table. The latter takes into account the vol. of CO_2 absorbed by 1 cc. of the urine. Self fermentation of the yeast sets free 0.1–0.3 cc. CO_2 at most. The method is accurate and compares well with polarization (Jolles). S. WALDBOTT.

A simple method for the estimation of the oxyproteic acid fraction in the urine. OTTO VON FÜRTH AND GUSTAV FELSENREICH. *Biochem. Z.* 69, 448–60(1915); cf. Sassa, *C. A.* 8, 3568.—The urine is treated with urease overnight, the resulting $(NH_4)_2CO_3$ changed into $(NH_4)_2SO_4$ by neutralizing with 10% H_2SO_4, the sirup diluted with alc., made acid to Congo red with H_2SO_4, more alc. added, filtered, the filtrate made alk. with NH_4OH, concd., $Ba(OH)_2$ added and the mixt. boiled until the NH_4OH is driven off, the Ba removed with CO_2 and the filtrate concd. to dryness with kieselguhr. The residue is extd. with alc. The N in the remaining "Ba fraction" is detd.; also that pptd. by $Hg(OAc)_2$ in alk. soln., "oxyproteic acid N." For human urine this was (average) 3.1% of the total N, the Ba-N 4.8%. C. J. WEST.

Detection of benzene in the organs and its distribution in the organism. GEORG JOACHIMOGLU. Univ. Berlin. *Biochem. Z.* 70, 93–104(1915).—The organs are rubbed with 100–150 cc. H_2O, placed in a liter flask, 12 cc. dil. H_2SO_4 added, and the C_6H_6 distd. over, using a Glinsky column, into a cooled flask containing 80 cc. CCl_4.

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The CCl_4-C_6H_6 is sepd. from the H_2O, and 10 cc. of a nitrating mixt. added (2 vol. fuming HNO_3 and 1 vol. concd. H_2SO_4). The mixt. is shaken 10–15 min., the CCl_4 removed on the H_2O bath, the acid mixt. diluted with 100 cc. H_2O, made alk., and extd. with Et_2O. The residue is identified as $C_6H_4(NO_2)_2$ by the color reaction with levulose, violet color with the *m*- and *o*-compds., or by Halphen's test (*J. pharm. chim.* 11, 373). The method is not quant., from 55 to 60% of the C_6H_4 being recovered. In C_6H_6 poisoning the brain and spinal cord contain more C_6H_6 than the other organs.

C. J. WEST.

2,5-Diketopiperazine and the formol titration. P. GLAGOLEV. *Biochem. Z.* 70, 119–23(1915).—A study of glycine anhydride, lactimide, tyrosine anhydride and glycylleucine anhydride shows that the diketopiperazines may be considered as practically not reacting with formol, and thus cannot be titrated by the method of Sörensen.

C. J. WEST.

Method of separate estimation of phenol and *p*-cresol in urine. M. SIEGFRIED AND R. ZIMMERMANN. Univ. Leipzig. *Biochem. Z.* 70, 124–9(1915); cf. *C. A.* 5, 2488.—Minor modifications of the original method are given. In the estn. of phenol the soln. is cooled to 15° before adding the bromide-bromate soln. and then allowed to stand 1 hr. at 0°; in the case of *p*-cresol the soln. is cooled to 5° and allowed to stand 15 min. at 0°.

C. J. WEST.

Method for the quantitative estimation of lactic acid in the urine. J. SCHNEYER. Vienna. *Biochem. Z.* 70, 294–8(1915); cf. Meissner, *C. A.* 9, 1188.—250 cc. urine are treated with 2 cc. satd. $CaCl_2$ soln. and 15–20 drops 10% NH_4OH and warmed to ppt. the oxalic acid. The filtrate is acidified with mineral acid, boiled 0.25 hr. to destroy any acetoacetic acid present, then concd. to a few cc., acidified with 5 cc. H_3PO_4 (d. 1.094), extd. with ether and the lactic acid detd. according to Meissner. C. J. W.

Use of borax and boric acid solutions in the colorimetric measurement of the hydrogen ion concentration of sea water. SVEN PALITZSCH. Copenhagen. *Biochem. Z.* 70, 333–43(1915); *Compt. rend. lab. Carlsberg* 11, 199(1915).—The H^+ ion concn. for mixtures of 0.05 *M* borax and 0.2 *M* boric acid soln. has been detd. Such a mixt. is especially useful on ships since the components can be weighed out and the soln. prepd. at any time. A small amt. of CO_2 in the water does not interfere. C. J. WEST.

Oxidation of substances containing sulfur with potassium chlorate and hydrochloric acid. MAX FEDERER. Univ. Berlin. *Z. physiol. Chem.* 94, 128–31(1915).—Gauvin (*C. A.* 8, 3192) states that the total S of the urine may be detd. by using $KClO_3$ and HCl as an oxidizing agent. F. finds that only a small % (7–12) of the neutral S of the urine is oxidized to H_2SO_4 and that the method cannot be used. The action of $KClO_3$ upon the S of substances like taurin, cystine and peptone is very slight.

C. J. WEST.

Color reaction of histidine. HERM. PAULY. Wurzburg. *Z. physiol. Chem.* 94, 426–8(1915).—Polemical against Aldrich (*C. A.* 9, 929). C. J. WEST.

KLOPSTOCK, M. AND KOWARSKY, A.: **Praktikum der klinischen chemisch-mikroskopischen und bakteriologischen Untersuchungsmethoden.** 3 Aufl. Wien. 8 M.

C. BACTERIOLOGY.

ERNEST D. CLARK.

The final hydrogen ion concentrations of cultures of Bacillus coli. WM. M. CLARK. U. S. Dept. Agric. *J. Biol. Chem.* 22, 87–98(1915).—The final H^+ concn. of cultures of *B. coli* in any given medium is const. With different media, varying values are found; the greater the buffer effect of the medium, the lower the final H^+ concn. Apparently other toxic substances are formed and superimpose their relatively

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small effect. For purposes of identification, the final H^+ concn. is regarded as superior to a detn. of the titratable acid produced. I. GREENWALD.

Formation of ellagic acid from gallylglycine by penicillium. MAXIMILIAN NIERENSTEIN. Univ. of Bristol. *Biochem. J.* 9, 240–4(1915).—Five g. gallylglycine and 2 g. $NaHCO_3$ were dissolved in 250 cc. water and the soln. saturated with CO_2. The sterilized soln. was then inoculated with *Penicillium* grown in a soln. of tannic acid which contained free sugar (see Geake and Nierenstein, *C. A.* 8, 1778). The soln. became cloudy after standing in an incubator for 32 hrs. at 42° and in about 78 hrs. a ppt. began to form. After an incubation of 22 days the *Penicillium* was removed and the ppt. collected and washed with dil. HCl. The product gave the specific Griesmayer reaction for ellagic acid (Nierenstein, *Hand. biochem. Arbeitsmeth.* (Abderhalden), 2, 999(1909)), and crystd. from pyridine in prismatic needles, which contained pyridine (see Perkin and Nierenstein, *J. Chem. Soc.* 87, 1415(1905)). B. HOROWITZ.

Copaiba oil and resin. RALPH R. STOCKMAN. Univ. Glasgow. *Brit. Med. J.* 2, 128(1915).—The resin in oleoresin of copaiba is nearly or quite without antiseptic action, but the oil of copaiba delays putrefaction and growth of microörganisms in urine. A. H. RAHE.

Experimental observations on the antiseptic action of hypochlorous acid and its application to wound treatment. J. L. SMITH, THEODORE RETTIE AND WILLIAM CAMPBELL. Univ. Edinburgh. *Brit. Med. J.* 1915, II, 129–36.—For use as an antiseptic, gaseous HClO is conveniently obtained by the action of boric acid on bleaching powder in the presence of a small amt. of water. The acid is obtained in soln. by the use of a larger amt. of water. To a mixt. of equal parts "chloride of lime" and boric acid the name "Eupad" is applied, while the soln. of free HClO is termed "Eusol." Owing to the presence of chlorates the acid is estimated by titration with 0.1 *N* H_3AsO_3. The acid is effective as an antiseptic both in soln. and when liberated as a gas, as from "Eupad," in a surgical dressing. A. H. RAHE.

Influence of sodium boroformate upon pathogenic bacteria. P. KÖTHNER. Berlin. *Arch. ges. Physiol.* 161, 577–94(1915).—Very dil. solns. of Na boroformate, or such solns. mixed with very dil. solns. of tartaric acid, favor the growth of bacteria. Higher concns. of the boroformate with tartaric, salicylic or hydrochloric acids have a marked bactericidal action. Best results are obtained with salicylic acid since the 2 products of decompn., HCO_2H and Na borodisalicylate, have a bactericidal action. C. J. W.

Food balances of the raw materials and the products of alcoholic fermentation. WILHELM VÖLTZ. Berlin. *Biochem. Z.* 69, 334–52(1915).—In the brewery the total loss of utilizable calories from 100 kg. barley (286,100 cal.) is 39,140. Of the original value 3.5 is found in the malt germ, 22.3 in the brewer's grains, 58.5 in the alcohol, 1.3 in the yeast and 0.7% in the "Trub." The loss is thus about 15%. For man the direct value is not higher than that found in the beer. In the distillery, because of the increase in the digestibility of the proteins, the relations are still more favorable. The change of potatoes into alc. and distiller's wash, under normal fermentation of 80%, leads to a loss of 6.3% (expts. on hogs) of the utilizable material, while with ruminants there is a gain of 8.5%. C. J. WEST.

Observations upon the coënzyme of the yeast. SIDNEY HAGMAN. Univ. Stockholm. *Biochem. Z.* 69, 403–15(1915).—The difference $\Delta - C$ in fermentation with washed yeast and with the coënzyme prepd. from yeast ext. is negative. The extent of the difference depends upon the time and upon the amt. of yeast and phosphates used. A coënzyme prepn. free of inorganic phosphates cannot activate a washed yeast. C. J. WEST.

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Retardation of the formation of indole by Bacillus coli in cultures by the addition of sugar. ALBERT FISCHER. Copenhagen. *Biochem. Z.* 70, 105–18(1915).—Of the sugars, lactose, maltose, galactose, glucose and fructose, only glucose completely retards the indole production by *B. coli*. The retardation occurs absolutely after 43 hrs. at a concn. between 1.80 and 2.25%. The acids formed play no role in the retardation. Neither the H^+-ion concn. nor the concn. of the undissociated acids can be taken as the reason for this retardation. The acid curves as well as the retardation expts. with a mixt. of galactose and glucose make it seem possible that the lactose is not first hydrolyzed by the *B. coli* but that it is fermented as such. The cause of the retardation depends upon a peculiar property of the glucose being able to inactivate the proteolytic enzyme of *B. coli*. C. J. WEST.

Influence of the alternating current upon the fermentation by living yeast. ERIK HÄGGLUND. *Biochem. Z.* 70, 164–70(1915).—A. c. increases the enzymic activity (the zymase action) of living yeast. At first this increase is very marked, being 100% in some cases. The relative velocity gradually decreases so that, after about 20% of the original sugar has been fermented, the two rates, with and without the current, are the same. The activity of carboxylase is not increased; the apparent increase in the case of pyruvic acid is due to the decompn. of the acid by the current. C. J. WEST.

The yoghurt bacillus. F. DUCHACEK. *Biochem. Z.* 70, 269–93(1915).—A careful comparison between the *Bacillus bulgaricus*, the principal factor of the Bulgarian sour milk (yoghurt) (B.-bac.) and a proteolytic enzyme of Effronts (E.-bac.), which Effront considered to be related, is made. Considerable differences are shown in the behavior of the two in regard to the nutritive medium. B.-bac. does not grow in a sugar-free medium, while E.-bac. will develop in a soln. of peptone in distd. H_2O. For B.-bac. the kind of sugar plays an important part. Glucose, galactose and lactose are most favorable, levulose and mannose are fermentable, while saccharose and maltose are entirely unsuited. E.-bac. does not ferment saccharose but decomps. 40% of maltose in 48 days. Besides a suitable sugar in an artificial medium, B.-bac. demands the addition of $CaCO_3$, which neutralizes the harmful effect of the excess acid and seems to affect the culture in yet other ways so that it cannot be replaced by any other carbonate. Ca monophosphate has no effect. The E.-bac. is indifferent to the presence of $CaCO_3$. B.-bac. is anaerobic while E.-bac. is aerobic. The 2 bacteria produce different products in their action upon lactose. B.-bac. forms *dl*-lactic acid, the amt. of which exactly corresponds to the loss in sugar content of the soln. E. bac. yields the *l*-lactic acid, in amt. corresponding to half the sugar used. It may be that the inactive acid is first produced and that this is then resolved by the E.-bac. E.-bac. produces succinic acid corresponding to 2.6% lactose, 10 times the amt. formed by the B.-bac. HCOOH and AcOH are formed from 12.9% of the sugar by E.-bac., 4 times the amt. produced by the B.-bac. The max. acidity produced by the B.-bac. is 2.6–3%, by the E.-bac. 0.5–0.6%. At this point the decompn. of sugar by the B.-bac. ceases, while the E.-bac. decomposes more sugar, without increasing the acidity. The acidity of the milk, which corresponded at first to 75% of the sugar, sinks after 4 wks. to 20%. All expts. show that B.-bac. is peculiarly a milk-bacillus. It dies rapidly, the rate depending upon the acidity. In the best medium, milk containing $CaCO_3$, it seldom remains alive over 3 mos. E.-bac. on the other hand is very easily kept alive. Attempts to change the B.-bac. into a proteolytic ferment, failed. C. J. WEST.

Action of certain kinds of lactic acid bacteria upon proteins and other nitrogen compounds. A. STUTZER. Königsberg. *Biochem. Z.* 70, 299–305(1915).—In the prepn. of silage the cold lactic acid bacteria (*B. cucumeris fermentati*) quickly change the sugar into acid, but a decompn. of protein with the production of amides does not take place. It is possible to increase the protein content by the addition of simple

N compds. Thus 1.8% of $AcONH_4$ is changed into protein by these bacteria, 17.4% asparagine and 6.5% of urea. C. J. WEST.

Fermentation of pyruvic acid by bacteria. II. L. KARCZAG AND L. MOCZAR. Univ. Budapest. *Biochem. Z.* 70, 317–9(1915); cf. *C. A.* 8, 1136.—*B. typhi murium, B. pneum. Friedlaender* and *B. odem. maligni*, which are capable of fermenting grape sugar, also ferment pyruvic acid. This is a further proof that pyruvic acid is decomposed and utilized only by sugar-decomposing bacteria; also, that there is a specific biological relationship between pyruvic acid and grape sugar. III. L. KARCZAG AND ELSE BREUER. *Ibid* 320–4.—While yeast and the saprophitic putrifying bacilli are capable of decomposing the mol. of the different α-keto acids (oxalacetic acid, phenylpyruvic acid, chelidonic acid, acetonedicarboxylic acid, acetylenedicarboxylic acid) with the formation of gaseous decompn. products, certain pathogenic bacteria, which are capable of decomposing the principal representative of the series, pyruvic acid, either do not split the above-named acids at all or do so with difficulty. IV. L. KARCZAG AND E. SCHIFF. *Ibid* 325–32.—Pyruvic acid is decompd. by *B. coli* through a number of intermediate substances almost quantitatively into gaseous products. This gas consists of about 90% H and 10% CO_2. HCO_2H and AcOH could not be found among the intermediate products. The small amt. of propionic and butyric acids is probably due to a secondary reaction. HCO_2H as well as glycollic acid are decompd. by a number of bacteria which decomp. pyruvic acid, with the formation of H. This suggests a genetic relationship between pyruvic acid and glycollic and formic acids, which may be considered as intermediate products in the fermentation of pyruvic acid. C. J. WEST.

Intestinal flora of rabbits fed on carrots and rabbits subjected to inanition. D. ROUGENTZOV. *Ann. inst. Pasteur* 28, 639(1914); *Zentr. Biochem. Biophys.* 17, 433 (1914).—A comparison of the qual. composition of the intestinal flora of fasting rabbits and those which had been fed carrots afforded no explanation for the appearance of indican in the urine of fasting animals. It is possible that the sugar present in the intestine of the rabbits which had been fed carrots presents an obstacle in some manner to the formation of indole by *B. coli*. On the other hand *B. coli* appeared to form sufficient indole in the absence of nutrient sugar to cause the appearance of its derivative, indican, in the urine of fasting rabbits. The increase in indole formation and indican excretion appears to indicate an increase in the number of *B. coli* in the intestine of fasting animals. H. S. PAINE.

Action of ethylhydrocuprein (optochine) on type strains of pneumococci in vitro and in vivo, and on some other microörganisms in vitro. HENRY F. MOORE. Rockefeller Inst. Med. Research. *J. Exp. Med.* 22, 269–85(1915).—Ethylhydrocuprein-HCl in very high diln. inhibits the growth of, and after 18 hrs., kills representatives of all 4 groups of pneumococci *in vitro*. These effects on bacteria other than pneumococci are very slight or absent. Quinine-HCl, in much stronger concns., inhibits the growth of and kills the pneumococcus *in vitro*. The free optochine base has a well marked protective action against exptl. pneumococcal infection in mice. G. M. M.

Grotan, a new disinfectant (AUMANN) 14. Formation of mucus in cream (STÖREN) 12.

MINDES, J.: **Chemisch-bakteriologisches Taschenbuch.** Wien. 113 ss. 3.50 M.

REITZ, A. UND BEINIKER, E.: **Apparate und Arbeitsmethoden der Bakteriologie.** Band 2. Stuttgart. 52 ss. 1.50 M.

D. BOTANY.

CARL L. ALSBERG.

Detasseling of maize Giant of Servia. E. HECKEL. *Compt. rend.* 159, 595–7 (1914); *Exp. Sta. Rec.* 32, 434.—The data show that by removing the tassel soon after

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it has expanded and fertilization of the ear has been assured, a somewhat higher content of saccharose and glucose was secured in the juice of the plant up to the early part of Sept., after which date it declined rapidly. A wide variation in this power to store up sugar was observed in individual plants. It is noted that the starch content fluctuated with the sugar content in the detasseled plants. E. J. C.

Is silica an indispensable constituent of plant food? M. LUNDIE. *Chem. News* 110, 200–2(1915); see *C. A.* 9, 1494. H. DUBIN.

The later researches on anthocyan. P. Q. KEEGAN. *Chem. News* 111, 87–8 (1915).—Evidence shows that there exists a special chromogen of anthocyan, *i. e.*, in the formation of the original blue, certain aromatic nuclei are deassimilated which are not like the aromatic nuclei that go to form original red. This view is antagonistic to that which holds that the protoplasm, due to varying degrees of oxidation, produces any and every kind of pigment in the corolla. K. draws the following conclusions: (1) Plants producing phloroglucol tannins yield original reds only; plants producing caffetannin yield original blues only; (2) plants producing gallotannin show vivid violets or warm purplish blues but never cold true blues; (3) yellow flowers are due to carotin or its diffused oxidized product (xanthophyll); (4) there is only one anthocyan pigment in plants producing caffetannin; (5) the white flower often encloses a dilute solution of anthocyan, chiefly because intense deassimilation has not taken place in the corolla, since nitrogen needed by reproductive organs has been fully supplied from sources other than the inflorescence. H. DUBIN.

Notes on plant chemistry. P. Q. KEEGAN. *Chem. News* 111, 289–90(1915).—The physical characteristics of the following plants are given, together with their chemical constitution: Bracken (*Pteridium aquilinum*); Pink Champion (*Lychnis dioica*); St. John's Wort (*Hypericum perforatum*); and Water Lily (*Nymphaea alba*). H. DUBIN.

Influence of chlorides and nitrates of potassium and sodium on germination H. MICHEELS. *Intern. Z. phys. chem. Biol.* 1, 412–9(1914); *J. Chem. Soc.* 108, I, 110.—The Cl-ion has a more injurious action than the NO_3-ion, and the Na-ion than the K-ion. The NO_3-ion exerts a beneficial action, especially in regards to length of the leaves, the wt. of the plant, and length of the root-hairs. The Na-ion appears to cause formation of a longer root than the K-ion. The same results were obtained by passing an elec. current through the solns., observing the germination at the electrodes. H. DUBIN.

The fluorescence of the components of chlorophyll. A. WILSCHKE. *Z. wiss. Mikroskop.* 31, 338–61; *Chem. Zentr.* 1915, I, 1173–4.—The statements of Tswett and Willstätter that the chlorophyll of green plants is made up of 2 fluorescent substances (*a*) with the fluorescent band λ 68–65.5 and (*b*) with the fluorescent band λ 65.8–65.3, is corroborated by the author who used a "Reichert Fluorescenz" microscope. The chlorophyll of phaeophyces, diatoms and hydrurus differs from the above. In the living state it shows only one fluorescent band similar to (*a*); when dead or in alc. soln., it shows a second band not quite like (*b*) but having the band λ 64.0–63.0, as Tswett showed. Willstätter however calls it chlorophyll component (*c*). In the chlorophyll of "*Nattia nidus avis*" only component (*a*) is found, due perhaps to a certain inactivity of the chlorophyll. H. DUBIN.

Chemical adjustments of the assimilation process. R. WILLSTÄTTER AND A. STOLL. *Zitsung. kgl. preuss. Akad.* 20, 322–46(1915).—A contribution to the theory of assimilation. The quant. relationship between the chlorophyll content and power of assimilation was investigated with normal, pigment-poor, and autumn leaves. The results show that in photo-synthesis, aside from chlorophyll, another factor, of enzymic nature, must be considered. B. HOROWITZ.

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Biochemistry of sea algae. HARALD KYLIN. Univ. Upsala. *Z. physiol. Chem.* **94**, 337–425(1915).—Several varieties of algae were studied. They differ markedly in their NO_3 content. All contain phosphates but the amt. is small and cannot be detected microchemically. The presence of inorg. I was shown for several varieties. Ca was found in the cell walls of all the algae investigated. Free organic acids are not present. Oxalates are present in very small amts. Three varieties examd. were found to contain from 5.2 to 6.8 of their dry wt. as mannitol. Among the sugars present, the florideae contain traces of dextrose and probably very small amts. of maltose. Trehalose is present in considerable quantity. In the fucoideae dextrose and maltose are present in small amts. A new sugar, *laminariose*, is supposed to be present. This must have a negative sp. rotation which upon hydrolysis gives rise to a positive rotation. Laminarin, white tasteless powder, is not a definite polysaccharide but a mixt. of related substances; these differ in rotation, mol. wt., solubility in H_2O and insolubility in alc. The form with a rotation —32.5° corresponds best with $6(C_6H_{10}O_5).H_2O$; that of —22.2° with $12(C_6H_{10}O_5).H_2O$, while that with the rotation of —13.5 corresponds well with $17(C_6H_{10}O_5).H_2O$. But these are probably mixts. They are acted upon by malt exts. The amt. of laminarin present varies from 7 to 35% of the dry wt. of the algae. Laminarin is a reserve substance, which is formed during summer and utilized during winter for the purposes of growth. It is probably formed from the sugars in place of starch. Fucoidin is extracted by 20% alcohol. It contains 29% ash and has $[\alpha]_D$ —220°. It forms H_2O-sol. salts. It is not colored by I, gives the pentose reaction, contains Me-pentoses and does not contain galactose. The phenylhydrazone of fucose was isolated. Algin is the Ca salt of *alginic acid*. This is nearly insol. in H_2O, sol. in NaOH, NH_4OH giving slimy solns. It is also sol. in the acetates of the alkali metals. It is not pptd. by AcOH. A slightly acid (AcOH) soln. is pptd. by mineral and strong org. acids, by alc. and large amts. of AcOH, by $CaCl_2$, $BaCl_2$, $ZnSO_4$, $CuSO_4$, $AgNO_3$, $FeCl_3$, but not by $MgSO_4$ and $HgCl_2$. It has $[\alpha]_D$ —136°. It gives the pentose reaction. HCl slowly hydrolyzes it. Fucin is the Ca salt of *fucinic acid*. This resembles alginic acid. $[\alpha]_D$ —120°. It gives the reaction for pentoses, is slowly hydrolyzed; the only characteristic difference of the 2 compds. is that fucin gives a blue color with I-KI and H_2SO_4 while algin does not.

G. M. MEYER.

Assimilation by green leaves. R. WILLSTAETTER AND A. STOLL. *Sitzb. kgl. preuss. Akad.* 1915, 524–31.—The assimilating capacity of various normal leaves was measured quant. under favorable conditions. Expts. with normal foliage in summer under conditions of max. assimilation do not indicate that the assimilatory action is dependent on the presence of a specific enzyme in conjunction with the chlorophyll content. In certain leaves the ability to assimilate decreases in proportion to the chlorophyll content in the fall of the year; there are other leaves, however, which continue to remain rich in chlorophyll while the assimilatory power falls off rapidly. Expts. were made to det. whether or not during the period of development in spring the coloring of the leaves proceeds simultaneously with the development of the enzyme necessary for the process of assimilation. These expts. proved that in the case of very young leaves the assimilatory activities, with respect to the chlorophyll content, are even greater than in the fully developed leaves. The chlorophyll content of the young leaves, referred to their original wt., is only about $1/4$ to $1/3$ that of the older leaves. The assimilatory figures indicate that at the beginning of the development of the foliage a parallel formation of assimilatory coloring matter and enzyme takes place. About 9 days later a period is reached in which the enzyme formation predominates, this being followed later by a period in which the chlorophyll is produced in excess. An exam. of etiolated leaves which have developed the green color, shows that as long as the

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chlorophyll content remains low the assimilatory figures are far greater than is the case with other young leaves. The difference lies in the fact that in this case the production of the chlorophyll and not that of the assimilatory enzyme is being surpressed. The behavior of the etiolated leaves seems to indicate that an enzymatic factor takes an active part in the assimilation. The upper leaves of chlorotic plants, poor in chlorophyll, yield normal or somewhat lower assimilatory figures, which would seem to indicate that a small amt. of enzyme goes hand in hand with a low chlorophyll content.

C. A. NOWAK.

Distribution of geotropic sensitiveness in roots and shoots. F. DEWERS. Strassburg. *Beih. Bot. Zentr. I Abt.* 31, 309–57(1914); *Zentr. Biochem. Biophys.* 16, 831–2 (1914).—As a result of expts. with roots and shoots in which $AlCl_3$ and $Al_2(SO_4)_3$ were employed D. concludes that this method is not applicable for testing the statolith theory of Haberlandt. H. S. PAINE.

Condition of the plasma and susceptibility to irritation; physiology of the living substance. A. HEILBRONN. Münster. *Jahrb. wiss. Bot.* 54, 357–91(1914); *Zentr. Biochem. Biophys.* 17, 629–30(1915).—H. studied the rate of motion of mobile starch granules under the influence of gravity. Sections of the starchy sheath of the soy bean and the coleoptiles of oats were used as exptl. objects. The portions of tissue under investigation were attached in their natural position to the perpendicular stage of a horizontally arranged microscope; after turning the stage through an angle of 180° H. then detd. the time required for a starch granule to migrate from the upper to the lower wall of the cell. The data obtained indicate that the viscosity of the living substance of the cells investigated was from 9 (the minimum) to 24 (the av.) times greater than that of H_2O. The plasma reacted to excitation-inhibiting influences (application of Et_2O, $CHCl_3$, C_6H_6, xylene) by the occurrence of physical rigor. Oat seedlings which had been subjected to the action of a narcotic assumed a different position after curvature from that assumed by non-narcotized control plants when both the treated and the untreated plants were so placed that geotropic and heliotropic stimulation acted perpendicular to each other with respect to their effects on the plants. After 24 hrs. totally narcotized coleoptiles, coleoptiles narcotized at the tip and non-narcotized coleoptiles formed angles of 86, 72 and 48°, resp., with the horizontal. In each case heliotropic sensitiveness was much more strongly and persistently depressed by narcosis than was geotropic sensitiveness. H. is unable to offer an explanation for this phenomenon. H. S. PAINE.

Action of ultraviolet rays on cells containing chlorophyll. J. STOKLASA. Prague. *Z. Pflanzenkrankh.* 24, 193–204(1914); *Zentr. Biochem. Biophys.* 17, 630(1915).—The leaves of various seedlings (peas, maize, oats, barley) which were exposed to the light from a Hg lamp in quartz assumed a deep green color after 2 hrs.; the control seedlings which were exposed to the action of intense sunlight were on the contrary always etiolated. It was remarkable that the same effect was produced by the direct action of the ultraviolet rays as in the expts. in which the lamp was equipped with a glass globe. S. concludes that rays of shorter wave length than $\lambda = 300\mu\mu$ have no influence on the formation of chlorophyll in etiolated seedlings; the max. wave length which is associated with chlorophyll synthesis is $575\mu\mu$. S. discusses the pathol. phenomena which are occasioned by the long continued action of ultraviolet light on leaves and flowers; the color of the flowers is not affected in the destruction of the protoplasm. Resistance to the action of ultraviolet rays depends almost entirely upon the nature of the plant. H. S. PAINE.

Coloring matters contained as glucosides in flowers of some Indian plants. A. G. PERKIN AND I. SHULMAN. *Proc. Chem. Soc.* 30, 200–1(1914).—The amt. of coloring matter isolated from various plants was very small, often not enough for analysis.

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The method employed was to treat the concd. alc. ext. with water, then remove the suspended waxy matter, digest the aq. soln. with boiling HCl to hydrolyze the glucosides, and isolate the coloring matter by means of ether. The use of $NaHCO_3$ soln. was found to be useful in purifying minute amts. of these substances. To this, the crude product dissolved in alc. is added and after agitation ether removes a fairly pure compd. *Poinciana regia* (350 g.) gave a coloring matter (0.31 g.) which crystd. in yellow needles, dissolved in alkalies with a yellow coloration and was found to be quercetin. An ext. of this had no dyeing effect on mordanted cotton. *Imflatiens balsomina* yielded but a trace of kaempferol which it crystd. from acetic acid in needles, m. p. 275–278° and gave a fluorescent soln. with H_2SO_4. *Woodfordia floribunda* (700 g.) gave 0.84 g. of crude coloring matter which consisted of 2 substances readily sepd. by means of alc. The sparingly sol. compd. crystallized from pyridine in needles and was recognized as ellagic acid. The sol. coloring matter (yellow needles, m. 285–291°) was possibly an impure quercetin. *Erythrina stricta* gave a trace of kaempferol, while flowers of the common fuschia (*F. marcostema globosa*) yielded traces of ellagic acid. R. L. SIBLEY.

Nature of the sugars found in tubers of sweet potatoes. K. MIYAKE. *J. Am. Pharm. Assoc.* **4**, 936–8(1915); see *C. A.* **9**, 2395. M. I. W.

The influence of Röntgen emanations on seed of Vicia faba (field bean) and on the development of plants. T. PFEIFFER AND W. SIMMERMACHER. *Landw. vers. Stat.* **86**, 35–43(1915); *Chem. Zentr.* **1915**, I, 1004.—The germination of seeds is hastened by short exposure to Röntgen rays and checked by long exposure. Measurements were made for exposures of 30–150 seconds. The growth of the plant above ground was somewhat increased by short exposure to Röntgen Em. Although the results were variable there was an indication of an increase in total dry matter produced from seeds which had been exposed for only a short time. E. H. WALTERS.

Relation between the influence of light and nitrogen on the growth of plants. TH. PFEIFFER, E. BLANCK AND W. SIMMERMACHER. *Landw. vers. Stat.* **86**, 45–62 (1915); *Chem. Zentr.* **1915**, I, 1004.—The authors investigated the influence of N and light on plant growth. Expts. conducted in 1913 support the conclusions of Mitscherlich (*C. A.* **7**, 3147) that all vegetative factors have an influence on the yield from the beginning. E. H. WALTERS.

Alkaloid formation in plants. I. The protein and nicotine content of the tobacco plant during growth. H. BAGGESGAARD RASMUSSEN. Copenhagen. *Biochem. Z.* **69**, 461–6(1915).—Analyses of leaves from 20 plants were made for total N, protein N, basic N and nicotine N. No relationship was found between the formation of alkaloid and the decompn. of protein. C. J. WEST.

Carbohydrates of pine wood. ERIK HÄGGLUND. *Biochem. Z.* **70**, 416–25(1915). —The sulfite liquors contain 2.3% sugar, consisting of 0.71 xylose, 1.04 mannose, 0.06 galactose, 0.06 fructose with 0.43% undetd. Of the total sugar then, 30% was xylose, 41.7 mannose, 2.6 galactose and 3 fructose. If the wood is hydrolyzed with 0.5% H_2SO_4 at 155° or 170° for 30 to 45 min., part of the cellulose is hydrolyzed so that glucose is present in the sugar mixt. The amt. of the sugar is 9% or 14.5% of the dry wt., depending upon the temp. The various sugars were, xylose 32.7 and 30.1, mannose 35.6 and 43.7, fructose 4.3 and 4.7, galactose 3.3 and 3.3, glucose 0.5 and 14.0, undetd. 23.6 and 4.2%. C. J. WEST.

The influence of phosphorus and magnesium on the formation of chlorophyll. EVA MAMELI. Univ. Pavia. *Atti accad. Lincei* **24**, I, 755–60(1915).—Willstätter (*Ann.* **350**, I (1906)) concluded that the green pigment of plants extd. either from fresh or dry leaves does not contain P or at least no more than traces due to impurities and thus the lecithin theory of chlorophyll of Hoppe-Seyler and Stoklasa was aban-

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doned. In spite of the fact that Marschlewski, Tswett and Czapek have all abandoned it Stoklasa (*C. A.* 3, 1411) retains it. After reviewing the expts. of Loew (*Bot. Centralbl.* 48, 37(1891)) and Servettaz (*Ann. sci. nat.* 17, 111(1913)) the expts. of Stoklasa, Sebor and Senft (*C. A.* 8, 2411) are described in which it was found that P forms part of the chlorophyll and that the chloroplasts are not formed without it, which result is contrary to the observations of M. (*C. A.* 7, 3991 and *Atti 1st. bot. Pavia* 15, 25(1912)). These expts. which were done with *Zea mais* and *Polygonum fagopyrum* were repeated and although unsatisfactory as conclusive expts. the results obtained were the reverse of those of S., S. and S. M. modified the nutrient solns. somewhat in order to get strictly comparable results and repeated the expts. again. (1) The complete nutrient soln. used was 1000 g. H_2O, 1 g. $Ca(NO_3)_2$, 0.25 g. KNO_3, 0.25 g. KH_2PO_4, 0.25 g. $(NH_4)_2SO_4$, 0.25 g. $MgSO_4$ and 0.02 g. $FeSO_4$; (2) the Mg-free soln. is the above less $MgSO_4$; (3) the P-free soln. is the above less KH_2PO_4. With soln. (1) there was vigorous growth and intense green coloration; with (2) moderate growth and pale coloration or quite complete etiolation; with (3) restricted growth and intense green coloration. It is concluded that the growth of *Zea mais* and *P. fagopyrum* in nutrient solns. deprived of Mg gives (as was previously found by M. (*l. c.*)) completely etiolated plants or plants very weakly green and containing chloroplasts abnormal both in form and color. The cultivation of the same species in nutrient solns. deprived of P gives plants having an intense green coloration with chloroplasts normal both in form and color. These results repeatedly obtained are contrary to those of S., S. and S. and support the analytical results of Willstätter on the presence of Mg and the absence of P in the chlorophyll mol. E. J. WITZEMANN.

ANDRÉ, G.: **Chimie végétale.** 2é ed. Paris: 588 pp.

E. NUTRITION.

PHILIP B. HAWK.

NORMAL.

Quantitative relation between temperature and standard metabolism in animals. A. KROGH. *Intern. Z. phys. chem. Biol.* 1, 491–508(1914); *J. Chem. Soc.* 108, I, 97.—This relationship has been detd. under conditions nearest to the basal metabolism which would result when all organs were absolutely at rest. Under such conditions, the influence of temp. on metabolism can be expressed in a definite curve which is not a straight line and cannot be expressed by Arrhenius' formula or van't Hoff's rule indicating the temp. relations of chemical reactions. The curves obtained for frogs and gold fish and, in one case, for a young dog are the same; the curve for chrysalides of Tenebrio is different, though of the same general type. H. D.

The assimilation of cholesterol and its esters. J. HOWARD MUELLER. Columbia Univ. *J. Biol. Chem.* 22, 1–9(1915).—Cholesterol, fed as such or as ester, is absorbed from the intestinal tract through the chyle and may be recognized in the contents of the thoracic duct. The ratio of free cholesterol to total cholesterol in the chyle is quite const. and appears to be unaffected by the administration of free cholesterol or its esters or of small amts. of free fatty acid with the food. I. GREENWALD.

Animal calorimetry. XII. The influence of the ingestion of fat. J. R. MURLIN AND GRAHAM LUSK. Cornell Med. Coll. *J. Biol. Chem.* 22, 15–41(1915); cf. *C. A.* 9, 1631.—Ingestion of fat increases the heat production of the dog, the max. increase occurring at about the 6th hr. when the concn. of fat in the blood is also at its highest. The increased heat production is at the expense of the ingested fat. If glucose be ingested at the height of the increased fat metabolism, the heat production is increased by the amt. that the glucose alone would have increased metabolism above the basal value. The respiratory quotient is then 0.93 or 0.94, indicating oxidation of both

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glucose and fat. When glucose and glycine are given together at the height of increased fat metabolism, the increase in heat production is very nearly equal to the sum of the increases which each of the three would have produced alone. I. GREENWALD.

The mineral excretion of the monkey. L. BAUMANN AND E. OVIATT. Univ. Iowa. *J. Biol. Chem.* **22**, 43–5(1915).—A metabolism expt. on a *Macacus* monkey gave the following results: Urinary S consists of 60.9% inorganic SO_4, 16.9% ethereal SO_4 and 22.2% unoxidized S. Almost all the Cl was excreted in the urine. Of the other elements, 98% of the P, 80% of the Ca and Mg and 25% of the Na and K were found in the feces. I. GREENWALD.

Experimental studies of urinary and blood nitrogen curves after feeding. O. H. PERRY PEPPER AND J. HAROLD AUSTIN. Univ. Penna. *J. Biol. Chem.* **22**, 81–6 (1915).—The daily variation of the non-protein blood nitrogen (N.P.N.) of the normal dog receiving a diet containing 0.4 g. of N per kg. is about 9 mg. per 100 cc., the max. being reached about 2 hrs. after feeding with a return to the original level in 10 to 14 hrs. With a greater intake of N, the N.P.N. may increase 25 to 40 mg. in 6 or 8 hrs. (occasionally later) and may not return to its original level in 24 hrs. The curve of N.P.N. generally parallels that of urinary N, but there may be a rise in N.P.N. when the urinary N is decreasing. In from 30 to 48 hrs. after feeding, the N.P.N. falls to from 12 to 18 mg. and then rizes to from 25 to 28 mg., at which level it remains. Urinary N shows a similar but less pronounced curve. An attempt to apply Ambard's formula, using total N instead of urea was unsuccessful. I. GREENWALD.

A note on the rate of metabolism of proteins and amino acids. N. W. JANNEY. Montefiore Home, New York. *J. Biol. Chem.* **22**, 191–3(1915).—From the data reported by Csonka (*C. A.* **9**, 1631) it is shown that the rate of protein metabolism may be practically identical with that of amino acids. "The time required by the organism to effect digestion of the complex protein molecule into amino acids and the metabolism of the latter is but little longer than that occupied by the simple process of absorption and elimination of glucose." I. GREENWALD.

The metabolic relationship of the proteins to glucose. II. Glucose formation from body proteins. N. W. JANNEY AND F. A. CSONKA. Montefiore Home, New York. *J. Biol. Chem.* **22**, 203–13(1915).—The av. ratio of glucose to N in the urine of the fasting phlorhizinized dog is 3.43. When fed to such dogs, dog muscle and other body proteins, rabbit, ox and chicken muscle protein all yield approx. the same amt. of glucose, 53–58%. (Gelatin gives 65%.) Cf. *C. A.* **9**, 1497. I. G.

The role of the digestive glands in the excretion of endogenous uric acid. LAFAYETTE B. MENDEL AND RAYMOND L. STEHLE. Yale Univ. *J. Biol. Chem.* **22**, 215–31 (1915).—The hourly uric acid excretion of men was studied in the fasting condition and after the ingestion of various foodstuffs, agar-agar, laxatives and EtOH and after the administration of atropine and pilocarpine. The passage of agar-agar through the intestine did not increase the excretion of uric acid. The ingestion of foodstuffs, particularly proteins, did increase the excretion of uric acid. Pilocarpine increased the excretion of uric acid and atropine diminished it. It is concluded that a portion of the endogenous uric acid may arize from the activity of the alimentary secretory apparatus. I. GREENWALD.

Fate of fatty acids in the survival processes of muscle. G. WINFIELD. *J. Physiol.* **49**, 171–9(1915).—Excized frog muscles were (1) allowed to undergo rigor at 30° in atm. of N, (2) fatigued in atm. of N, (3) alternately fatigued in N and revived in O. No constant well marked change occurred in the total fatty acids nor in the I nos. of the fatty acids. There is no evidence that lactic acid is produced from fat in the surviving amphibian muscle. J. F. LYMAN.

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Influence of protein and protein decomposition products upon the glycogen formation in the surviving turtle liver. A contribution to the question as to the function of the liver in the utilization of proteins and protein decomposition products. HENRY B. RICHARDSON. Univ. Bern. *Biochem. Z.* 70, 171–90(1915).—Perfusion of the turtle liver with a Ringer-sugar soln. containing peptone retards very markedly the formation of glycogen. The same effect is obtained with hydrolyzed casein. Ereptone has no influence upon the glycogen formation. It is possible that there is first a retarding and then an accelerating effect. An amino-acid mixt., containing glycocoll, leucine, *d*-alanine and *l*-valine, has no effect upon the formation of glycogen. This makes it necessary to test the different effects of amino acids upon the normal and diabetic organism. Glutaminic acid retards the formation of glycogen in the surviving turtle liver. C. J. WEST.

The diazo reaction of dog urine and its relation to the course of metabolism. M. MASSLOV. Univ. Vienna. *Biochem. Z.* 70, 306–16(1915).—The relative amt. of chromogen, reacting with diazo substances to form dyes, occurring in the normal dog urine can be detd. according to the colorimetric method of Weiss and Ssobolew for histidine. The excretion of this "diazochromogen" in the urine is independent of the amt. of histidine complex contained in the protein used as food and of the histidine contained in the carnosine of the flesh foods. On the other hand, there is an intimate relationship between the excretion of the diazochromogen and the simultaneous total protein exchange in the organism, in that the two curves have the same form. The chromogen may perhaps be of endogenous rather than of exogenous origin. This is considered a further step in proving Weiss's supposition that the diazochromogen of normal dog urine as well as that of pathological human urine belongs to the group of oxyprotein acids. C. J. WEST.

Numerical laws governing the rate of excretion of urea and chlorides in man. I. An index of urea excretion and the normal excretion of urea and chlorides. FRANKLIN C. MCLEAN. Rockefeller Inst. Med. Research. *J. Exp. Med.* 22, 212–36(1915); *Am. J. Physiol.* 36, 357(1915); *Med. Record* 87, 624(1915).—The excretion of urea and of chlorides in the normal individual is carried out according to definite laws, capable of numerical expression. The rate of excretion of urea and of NaCl is detd. by the concn. in the blood, the rate of H_2O output and indirectly by the wt. of the individual. The threshold of NaCl excretion is practically const. at 5.62 g. of NaCl per l. of plasma. Slight variations occur in normal individuals. The rate of excretion of urea under the conditions found at any time can be measured directly in terms of the normal by an index of urea excretion. This index is calcd. from the formula

$$\text{Index} = \frac{[\text{g. per 24 hrs.} \times \sqrt{\text{g. per l. urine}} \times 8.96]}{[\text{wt. in kg.} \times (\text{g. urea per l. blood})^2]}.$$

The plasma NaCl may be obtained by using the formula

$$\text{Calcd. plasma NaCl} = 5.62 + \sqrt{\frac{\text{g. NaCl per 24 hrs.} \times \sqrt{\text{g. per l. urine}}}{\text{wt. in kg.} \times 4.23}}.$$

G. M. MEYER.

ABNORMAL.

Protein metabolism in fever and during work. Studies on the nitrogen minimum. R. KOCHER. *Deut. Arch. klin. Med.* 115, 82–123(1914); *Expt. Sta. Record* 32, 564. —Observations upon fever patients who were given a diet which supplied 80 cals. per kg. of body wt. showed the N metabolism to be excessive. With a decrease in temp. to normal the N minimum was reached. A corresponding decrease in the values of uric acid, creatinine, P and S was also noted. K. suggests that the rise in body temp. during fever may be caused by a sp. action of the fever on the cell protoplasm. E. J. C.

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Treatment of infantile beriberi with the extract of tiqui-tiqui. José Albert. *Philippine J. Sci.* (*B*) 10, 81–5(1915).—This method of treatment has been found by A. to be very efficient, especially if the disease is taken in the early stages. H. D.

Urobilin in the stool in pernicious anemia as influenced by splenectomy, transfusion and salvarsan. Oswald H. Robertson. Mass. Gen. Hosp. *Arch. Intern. Med.* 16, 429–36(1915).—(1) In 6 cases of pernicious anemia with splenectomy, the urobilin output which had previously been high, fell immediately after the operation. Two of these, in which the urobilin excretion returned to a high level, and in another in which it remained high, showed less improvement than those in which it remained normal. (2) Of 4 patients transfused, 3 gave evidence of stimulation of the bone-marrow and also a temporary increase in urobilin excretion. (3) In 3 patients, salvarsan had no effect upon the course of the disease or on the urobilin excretion. I. G.

Metabolism studies before and after splenectomy in congenital hemolytic icterus. Samuel Goldschmidt, O. H. Perry Pepper and Richard M. Pearce. Univ. Penna. *Arch. Intern. Med.* 16, 437–55(1915).—In a child with congenital hemolytic icterus, splenectomy was followed by a disappearance of the discoloration of the skin, a rapid improvement in the condition of the blood and a striking improvement in general health. Metabolism studies gave the following results: (1) The utilization of N was good at all times. A slight retention before splenectomy was followed by an increased retention, 8 days after the operation. (2) After the operation, the excretion of uric acid diminished 47%; that of creatine at first increased about 90%, then returned to its former value. (3) There was no change in the excretion of total creatinine, or of other nitrogenous metabolites, or in H^+ concn. (4) Fat metabolism was normal. (5) The loss of Fe in the feces was diminished by 40% after the operation. (6) After the operation the amt. of urobilin in the feces was only about $^1/_9$ of the former amt. I. G.

A study of the protein metabolism under conditions of repeated hemorrhage. A. E. Taylor and H. B. Lewis. Univ. Penna. *J. Biol. Chem.* 22, 71–5(1915).—Under Et_2O anesthesia, dogs were bled and the blood replaced by an equal vol. of Ringer soln. This was repeated 3 or 4 times at intervals of 1 hr. The changes in the blood observed were: (1) Progressive decrease in total N and total protein. (2) The relation between globulin and albumin in the plasma was disturbed but in different directions and to different degrees in the several expts. (3) Non-protein N and NH_2-N were increased. (4) Blood sugar was relatively const. The changes in protein distribution are thought to be due to a washing-out of the tissues, those in non-protein N to a liberation of stored NH_2-acids or to a hydrolysis of protein. I. Greenwald.

The relationship of creatinuria to changes in the sugar content of the blood. William MacAdam. Univ. Glasgow. *Biochem. J.* 9, 229–39(1915).—M. repeated Underhill's expts. (*J. Biol. Chem.* 10, 159; 10, 270(1911)) wherein hydrazine was administered to rabbits in doses of 50 mg. per kg., and the change in the sugar content of the blood noticed. M. found that instead of the variable results obtained by Underhill, constant effects could be obtained by using a suitable dose of hydrazine (usually more than 50 mg.). Under such conditions there results a hypoglucemia which is invariably associated with creatinuria. If no change in the sugar content is produced, creatine is not found in the urine. B. Horowitz.

The injurious effect of an exclusive oat diet, leading to an acid poisoning. A. Morgen and C. Berger. Hohenheim. *Z. physiol. Chem.* 94, 324–36(1915).—On a pure oat diet rabbits steadily lose wt., gradually eat less and sooner or later become emaciated and anemic. No diseased conditions of the bones were found. Addition of di-Ca phosphate or NaCl had no influence upon the condition. Addition of $CaCO_3$ or $NaHCO_3$ corrected the harmful influence; the animals gained in wt. and ate a con-

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stant or increasing amt. of oat diet. This leads to the conclusion that the cause of the harmful action is not so much a lack of Ca as it is an acid poisoning, due to the fact that the oat diet does not furnish sufficient basic mineral matter to neutralize the acids formed in the oxidation of proteins. Under certain conditions this acid poisoning might lead to a diseased condition of the bones. G. M. MEYER.

Etiology of pellagra. II. CARBONE AND CAZZAMALLI. *Giorn. r. soc. ital. d'igiene* 1914, 5–14, 51–63, 99–108, 151–6; *Zentr. Biochem. Biophys.* 17, 635–6(1915).—In continuation of previous studies in which C. and C. did not succeed in effecting chem. sterilization of maize the attempt is now made to produce exptl. pellagra in gray mice. The animals were kept in a well lighted room and fed exclusively on polenta prepd. from corn meal which had been infected with various molds obtained from pellagrous media; among these molds were a pathogenic, slightly toxic race of *Aspergillus fumigatus*, a non-pathogenic but very toxic *Penicillium*, a race of *Mucor racemosus* with similar properties and a moderately toxic race of *Trychoderma lignorum*. While the mice which were fed polenta prepd. from normal corn meal showed no ill effects after several mos. of this diet, the polenta prepd. from maize infected with *Aspergillus fumigatus*, *Penicillium* and *Mucor* produced, after a short time, more or less pronounced modifications of the skin and hair and the digestive and respiratory organs. In the case of polenta prepd. from corn meal infected with *Trychoderma* no clinical phenomena were observed after 7 mos., although autopsy disclosed the existence of dilatation of the stomach and atrophy of the gastric mucosa. The results of these studies apparently support the theory of participation of maize toxins in the production of pellagra. The basis for the establishment of the etiology of pellagra must, however, be extended to include a study of human pellagrous individuals both before and after death; the purely exptl. studies are primarily of value from the standpoint of food hygiene.
H. S. PAINE.

Metabolism in psychoses. II. K. TOGAMI. Kiushu, Japan. *Monatschr. Psych. Neurol.* 36, 42–105(1914); *Zentr. Biochem. Biophys.* 17, 420(1914); cf. *C. A.* 8, 2896.—The reducing power of the urine in psychoses is independent of the sp. wt. and the amt. of the urine. The Worm-Müller test was found to be much more sensitive than the Almén test in the present expts. The values for reducing power were greatest in melancholia and dementia paralytica. The assimilation limit for sugar was distinctly diminished in arteriosclerotic insanity, psychopathic degeneration and stuporous melancholia, but not in mania, paranoia and dementia praecox. The reducing power of the urine was increased in all cases after administration of lactose. The values for reducing power were remarkably low in mania and infantilism. No decrease in the assimilation limit was observed in alc. psychoses. Great variations were observed in the P content in psychoses; it was remarkable that the values in the feces and urine always remained parallel. The P values in catatonia and paralysis were very low. In dementia paralytica the total P of the urine was considerably diminished during periods free from seizures; it was always increased after a seizure. Kidney function, as measured by salol excretion, was undisturbed. Similar relations were observed in catatonia, except that a retardation of salol excretion was observed in cataleptic and stuporous conditions (also in melancholia). Salol excretion ensued promptly in imbecility and infantilism. H. S. PAINE.

F. PHYSIOLOGY.

ANDREW HUNTER.

Urine secretion of the infant. ENGEL. *Deut. med. Wochschr.* 40, 1960–1(1914).—Receptacles consisting of a flask armed with Pt electrodes and a side tube were attached to infants. Urine entering the flask closes the elec. current leading to a bell. When the signal is sounded the urine is let out through the side tube. In this manner

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the number of discharges of urine, as well as the amt. of each discharge, could be detd. Frequency of urination is more or less dependent upon the amt. of urine voided. The av. normal number of urinations is about 25 in 24 hrs. Introduction of an excessive amt. of fluid increases this number to 60–70. During sleep urination is practically nil and is dependent upon the state of mobility and excitation of the infant. The max. amt. of urine in a single fraction during the first year of life was 50–60 cc. It may rize to 70–90 cc. For the majority it varies between 10 and 20 cc. S. AMBERG.

Serodiagnosis of pregnancy in mares. C. F. BRISCOE AND E. M. RANCK. Miss. Agr. Expt. Sta., *Tech. Bull.* 5, 8 pp.(1915).—The authors show by a series of tests that the serodiagnosis of pregnancy is applicable to mares. Precaution should be taken against sources of error, from bacterial contamination, and from digestion products in the blood of the animal tested. H. DUBIN.

The rate of the passage of fatty acid of food into the mammary glands of the goat. O. C. BOWES. Columbia Univ. *J. Biol. Chem.* 22, 11–3(1915).—The milk obtained from a goat 12.5 hrs. after feeding arachis oil contained arachic acid, though none had been found in the milk before the feeding with the oil. I. GREENWALD.

The formation of specific proteolytic ferments in response to the parenteral introduction of foreign protein. ALONZO E. TAYLOR AND FLORENCE HULTON. Univ. Penna. *J. Biol. Chem.* 22, 59–61(1915).—Two rabbits each received 3 doses of protamine (100 mg. per kg.) at intervals of 10 days. A week after the last injection, the animals were exsanguinated, the blood defibrinated and, after the addition of 0.65 g. protamine and enough alk. to make the soln. 0.0001 *N*, incubated at 38° for 24 hrs. The blood of a normal rabbit was similarly treated. The blood was then coagulated by heat, filtered and the filtrate evapd. at 70° to a little less than the original vol. of blood. This was then pptd. with 9 vols. of abs. EtOH and total N detd. in the filtrates. Those obtained from the rabbits treated with protamine contained rather less N than that from the normal rabbit. It is concluded that the rabbit does not form a sp. proteolytic enzyme after the parenteral administration of any protein, nor is the normal amt. of trypsin increased nor that of antitrypsin diminished. I. G.

The predominance of the liver in the formation of urea. A. E. TAYLOR AND H. B. LEWIS. Univ. Penna. *J. Biol. Chem.* 22, 77–80(1915).—Analyses of portal and of peripheral blood in dogs from whom the alimentary tract had been removed 30 min. previously, showed only a very little higher content of non-protein N and of urea in the portal blood than in peripheral blood. The results indicate that urea is formed in all the tissues and not chiefly in the liver. I. GREENWALD.

The question of fat absorption from the mammalian stomach. LAFAYETTE B. MENDEL AND EMIL J. BAUMANN. Yale Univ. *J. Biol. Chem.* 22, 165–90(1915).—"... No trace of fat absorption from the stomach could be demonstrated (1) by a study of blood fat after introduction of fat into the ligated stomach, for here no rise in the fat content of the blood could be obtained; or (2) by tracing absorbed fat with the aid of sudan III under similar conditions. The absorption of fat from the intestine was readily demonstrated under the same exptl. procedures." The fat histologically demonstrable in the cells of the gastric mucosa does not, to any appreciable extent, pass into the blood or into the lymph. I. GREENWALD.

The presence of creatinine in the muscles and the behavior of creatine during fatigue. V. SCAFFIDI. *Arch. ital. biol.* 61, 168–76(1914); *Expt. Sta. Record* 32, 764.—In the muscle of the animals studied, and probably in muscular tissue in general, preformed creatinine does not exist. Creatinine is not found in the muscles of the frog as a result of fatigue. It is probable that creatinine is destroyed as fast as formed in muscular tissue. As the result of muscular fatigue creatine undergoes no marked

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modifications. It is difficult to determine to what extent creatine is consumed and rebuilt from the protein decompn. products in the individual muscle. E. H.

Ovarian factor concerned in the recurrence of the oestrous cycle. F. H. A. MARSHALL AND J. G. RUNCIMAN. *J. Physiol.* 49, 17–22(1914).—The occurrence of "heat" in bitches does not depend on the presence of mature Graafian follicles in the ovaries, nor on corpora lutea. J. F. LYMAN.

Fatty acid metabolism in the liver. IV. The relation of iodine values of mesenteric and kidney fatty acids to those of liver fatty acids in pregnant and lactating rabbits. R. COOPER AND V. H. MOTTRAM. *J. Physiol.* 49, 157–61(1915).—I absorption no. of liver fat is intermediate between that of depot (mesentery) fat and tissue (kidney) fat. The latter is very const. while the value for depot fat varies widely. At or about the time of parturition the I nos. of liver fatty acids lie nearer those of the mesenteric fatty acids than in normal control animals, indicating an infiltration of depot fat. J. F. LYMAN.

The origin of antithrombin. G. P. DENNY AND G. R. MINOT. *Am. J. Physiol.* 38, 233–47(1915).—Expts. show that antithrombin is formed in the liver. (1) When stasis is produced in liver, spleen, kidneys, and intestine, liver blood alone shows a definite increase in antithrombin. (2) Perfusion of the liver with defibrinated blood causes an increase of antithrombin in the perfusate; perfusion of other organs gives a decrease rather than otherwise in antithrombin. (3) After P poisoning and liver destruction antithrombin is decreased. Attempts to stimulate the liver to production of antithrombin by bile, bile salts, secretin, and elec. stimulation failed. Small amts. of thrombin added to portal blood produced a slight rise in antithrombin. J. F. L.

Physiology of the stomach. XXV. Chemistry of normal human gastric juice. A. J. CARLSON, *et al.* *Am. J. Physiol.* 38, 248–67(1915).—Gastric juice unmixed with saliva or food collected from a gastric fistula case contained:

	Appetite juice.	Hunger juice.	Contents empty stomach.
Sp. gr.	1.006–1.009	....	1.004–1.006
Δ	—0.530°–0.538°	....	—0.31°–0.45°
Total acidity	0.40–0.53 av. 0.48%	0.20–0.45 av. 0.34%	0.15–0.40 av. 0.23%
Free acidity	0.35–0.44 av. 0.40%	0.15–0.35 av. 0.25%	0.10–0.35 av. 0.18%
Total solids	0.480–0.606 (g. in 100 cc.)	0.667 (g. in 100 cc.)	0.360–0.450 (g. in 100 cc.)
Organic solids	0.341–0.470 "	0.521 "	0.260–0.350 "
Inorganic solids	0.110–0.140 "	0.146 "	0.100 "
N	0.051–0.075 "	....	....
NH_3	0.002–0.003 "	....	....
Amino acid N	0.003–0.009 "	....	....
Total Cl	0.49–0.56%	0.24–0.53%	....

Attention is called to the large amt. of pepsin secreted in 24 hrs. (enough to digest 1500 g. protein (coagulated egg white) in 3 hrs.), also to the high acidity of normal appetite juice (nearly 0.5%), an amt. ordinarily reported as hyperacidity by clinicians. The acidity of the contents of the empty stomach may be reduced by regurgitation of duodenal contents into the stomach. J. F. LYMAN.

Pituitary secretion. DOUGLAS COW. *J. Physiol.* 49, 367–77(1915).—Normal cerebrospinal fluid contains no demonstrable active principle. One hr. after injection of ext. of duodenal mucous membrane (boiled or unboiled) an active principle which fulfilled every test for pituitrin was present. Channels of communication exist between the ventricular cavity in the infundibular stalk and spaces in the anterior lobe of the pituitary. J. F. LYMAN.

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Corpus luteum, menstruation and pregnancy. JOHN WILLOUGHBY MILLER. Heidelberg. *Arch. Gyn.* 101, 568(1914); *Zentr. Biochem. Biophys.* 16, 841(1914).—Efforts (*in vitro*) to detect an internal secretion of the corpus luteum did not succeed, since no antibodies are produced by the hormones. Attempts to detect an internal secretion of the corpus luteum by means of *intra vitam* staining were also without success. Pregnancy toxicoses are probably due to hypofunction of the corpus luteum.
H. S. PAINE.

Physiology of the thyroid, phosphorus, nitrogen and lipoids in the case of thyroidectomized animals. A. I. YUSCHENKO. *Arch. sci. biol. Petrograd* 18, 121(1914); *Zentr. Biochem. Biophys.* 17, 426(1914).—A decrease in the content of total and organic P, and usually an increase in the content of inorganic P, were observed in the brain, heart and spleen of thyroidectomized and parathyroidectomized dogs. These variations in P content were less pronounced in the liver and muscles; an increase in all P values was observed in the kidneys. The content of total and organic P of the serum increased, while that of inorganic P decreased. The total N content of thyroidectomized animals increased in the brain, liver, muscles and spleen and decreased in the kidneys and serum; these values were reversed in a hyperthyroidized dog. A decrease in the lipoid content of the brain, liver and muscles of thyroidectomized animals was observed; the lipoid content of the serum increased, while the total lipoid content of all the other organs decreased. Only the lipoids of the alc. fraction showed an increase in the heart and kidneys. In hyperthyroidism the lipoid content of the serum increased, while that of the organs remained practically unchanged. The accumulation of purines in the organs constituted another deviation from the normal in thyroidectomy. The variations in the urine constituents were those which have already been observed.
H. S. PAINE.

The spleen as an iron assimilative organ. PAUL CHEVALLIER. Paris. *Arch. path. Anat.* 217, 358(1914); *Zentr. Biochem. Biophys.* 17, 653(1915); cf. *C. A.* 9, 2551.—Expts. on pigeons and guinea pigs showed that the changes produced by splenectomy do not ensue directly after removal of the spleen, but persist for several months after their occurrence and finally diminish. Injections of Fe caused siderosis which could be distinguished as parenchymatous and macrophagic. The former was readily produced in normal guinea pigs by hemoglobin injections and is to be regarded as a consequence of overtaxing the spleen with difficultly assimilable Fe; it was also observed almost exclusively in splenectomized animals, and to a considerable degree, when, for instance, Fe-containing salts or solns. of human blood corpuscles were injected (excretion siderosis occurred in these cases). The Fe which appeared in the small intestine and liver penetrated the epithelia alone and was then eliminated by the latter. Pigment cirrhosis may also be occasioned in the liver by simultaneous lesion. Siderosis of the macrophages is normally localized in the spleen. Small pigment-containing granules with positive Fe reaction appeared in the macrophages of the spleen after incorporation of salt solns. or hemoglobin; the cells became over-filled with siderocytes, although the granules gradually disappeared with formation of vacuoles in the protoplasm. The transformation of these siderocytes is considered to indicate that the Fe is transformed in the cell into a sol., complex, invisible product which is capable of being assimilated by the organism, since, on any other assumption, a pronounced excretion (which, in fact, does not occur) would be observed in non-splenectomized animals. Siderocytes may also be detected in the intestinal villi, omentum, capillaries of the liver and mesenteric lymph glands. All of these organs may be regarded as vicarious for the spleen and their importance is plainly shown after splenectomy, while no such significance is attached to the bone marrow. When the vicarious function of the above organs is diminished the elimination of Fe is decreased. Fe in practically

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any combn. may be assimilated, although Fe of exogenous origin is apparently more readily assimilated than that of endogenous origin; the Fe is absorbed by the spleen by which it is transformed and finally assimilated. The Fe liberated by destruction of tissue, as well as that obtained directly from the food, is stored by the spleen, thereby preventing the immediate excretion of this Fe. The Fe which has thus been changed into assimilable form then appears in combn. in the various Fe-containing mols., especially those of hemoglobin, and constitutes the principal factor in the oxidative processes of the organism. H. S. PAINE.

Composition of the saliva and the salivary reflexes. S. P. LUBIMOV. *Russ. Vrach.* 14, No. 12(1915); *J. Am. Med. Assoc.* 65, 987.—The viscosity of the saliva depends on the quality of the food being taken. Expts. with dogs showed that feeding dry toast at 5-min. intervals was followed by a progressive decrease in the viscosity of the saliva. When given 10 cc. of 0.25% HCl at 5-min. intervals the viscosity of the saliva increased and the secretion was more profuse. These and other tests showed that frequent irritation with food causes a diminution in the quantity of the saliva, and of its solid content. Substances other than food produce opposite results. L. W. RIGGS.

Digestive activity and composition of different fractions of the pancreas. I. J. H. LONG, MARY HULL AND H. V. ATKINSON. *J. Am. Chem. Soc.* 37, 2427–30(1915).—The minced pancreas were sepd. into 3 layers by centrifuging (cf. *C. A.* 9, 2666) and the layers analyzed separately. Below are given the results, the first 3 under each heading referring to the upper, middle and lower layers, resp., of hog pancreas, the second 3 to beef pancreas and the last 3 to sheep pancreas. The starch digesting power is expressed in numbers of parts of starch (1% paste) digested to the colorless end point in 10 min. at 40° by 1 part by wt. of the ferment mass. The fibrin digestions are expressed in mg. of amino N (measured by HCHO titration) liberated by 1 g. or cc. of substance allowed to act on an excess of fibrin 18 hrs. at 37°. Approx. wt., % of whole: 36.3, 17.2, 46.0; 16.0, 23.4, 60.6; 3.2, 12.5, 84.3. Solids, % of fraction: 49.3, 15.0, 31.2; 60.0, 11.4, 29.6; (90.0), 14.2, 26.4. Fat, % of fraction: 34.0, ——, 6.8; 50.7, ——, 8.3; (85.0), ——, 4.5. P, % of fat: 0.27, ——, 0.27; 0.26, ——, 0.27; ——, ——, 0.29. P, % of fraction: 0.37, 0.46, 0.47; 0.30, 0.47, 0.50; ——, 0.40, 0.51. N, % of fraction: 1.49, 2.22, 3.42; 1.16, 1.87, 2.95; 0.19, 1.88, 3.02. P_H: ——, 5.541, ——; ——, 5.537, ——; ——, 5.7, ——. F. p. depression: ——, 1.62°, ——; ——, 1.12°, ——; ——, 1.13°, ——. Starch digestion: 0.44, 1.54, 1.78; 0.12, 0.82, 0.49; 1:0.08, 1:0.17, 1:0.25. Fibrin digestion: 0.029, 0.017, 0.036; 0.016, 0.015, 0.029; ——, 0.013, 0.019. CHAS. A. ROUILLER.

Physiology of the thyroid gland. V. The cause of the increased protein decomposition and heat formation in infectious fevers. G. MANSFELD AND Z. ERNST. Univ. Budapest. *Arch. ges. Physiol.* 161, 399–429(1915).—The marked increase in protein metabolism during experimentally produced fevers in normal animals is entirely lacking in animals from which the thyroids had been removed. Likewise, the calories produced during fever increase only 3.2% as against 25.6% in normal animals. This can be due only to a decreased loss of heat from the body. **VI. Glycogen mobilization in animals lacking the thyroid.** PAULA BLUM. *Ibid* 488–91.—The thyroid has no influence upon the utilization of the liver glycogen. **VII. Mechanism of the action of iron and arsenic.** S. NEUSCHLOSZ. *Ibid* 492–501.—Iron causes an increased blood formation in both normal and anemic animals, the effect being more pronounced in the latter. The removal of the thyroids does not affect its action. Arsenic, while acting more slowly, produces an increased blood formation in normal and anemic animals. It is without effect, however, on those animals from which the thyroids have been removed. **VIII.** G. MANSFELD. *Ibid* 502–5.—A normal animal

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excretes about 4 g. N daily; the removal of the thyroid decreases this amt. to about 1.75 g. Such animals are not affected by the subcutaneous injection of 5 mg. HCN. The N-excretion for the two days before death from hunger was 0.66 and 0.65 g. C. J. WEST.

Mechanism of glycogen mobilization. PAULA BLUM. Univ. Budapest. *Arch. ges. Physiol.* **161**, 516–8(1915); cf. preceding abstr.—Neither the splanchnic nor the vagus nerve is necessary for the mobilization of the liver glycogen during excessive muscular work (strychnine cramps). The coördination between the cells utilizing the sugar and the liver seems to be through the blood stream. C. J. WEST.

The method of chemical heat regulation. G. MANSFELD AND ST. HAMBURGER. Univ. Budapest. *Arch. ges. Physiol.* **161**, 430–43(1915).—The normal heart of normal animals used, as the average of 29 expts., 2.2 mg. sugar per g. heart per hr., while the isolated heart of rabbits with fever used 3.7 mg. The heart of the animals with fever thus showed, after sepn. from the nervous system, an increased consumption of 68%. This increased sugar consumption in fever animals is completely independent of the glycogen content of the heart; during fever the glycogen of the heart remains about the same. Thus the increased production cannot be the result of increased innervation; perhaps the stimulation of the nervous system is an impetus for the increase of the oxidation, which, once started, continues without the coöperation of the nerves and may be maintained by chem. substances (hormones). C. J. WEST.

Chemical muscle tonus. I. G. MANSFELD AND ALEXIUS LUKACS. Univ. Budapest. *Arch. ges. Physiol.* **161**, 467–77(1915).—Using the Zuntz-Geppert method it is shown that the respiratory metabolism of a curarized dog suffers a decrease when the muscles of the lower extremities are unnerved. Thus a chem. tonus of the striated muscle is present, which is regulated by those nerves not paralyzed by curare. If the same nerves are cut during the metabolism expt. there is no sign of a decrease of the oxidation. Thus the chem. muscle tonus is regulated by the sympathetic system, the same as von de Boer has proven for the mechanical muscle tonus of the frog. **II.** G. MANSFELD. *Ibid* 478–82. **III.** Z. ERNST. *Ibid* 483–7.—It is shown that sympathetic innervation of the muscles causes no burning of carbohydrates; thus the tonus and the quick contraction have their origin in different substances and are the results of different chem. processses. C. J. WEST.

Physiology of the rabbit pancreas. P. V. GRÜTZNER AND W. SCHLÖR. *Arch. ges. Physiol.* **161**, 519–29(1915).—The pure pancreas secretion, concd. or dil., has a very slight digestive action upon fibrin and fats; it is as active as the activated secretion upon raw or boiled starch. Gelatin or coagulated egg protein are not attacked by the pure secretion. The activated secretion (by enterokinase) digests fibrin and fat very readily, but digests starch at the same rate as the pure secretion. Gelatin and coagulated egg white are digested to a small degree. The secretion of hungry animals seems to be richer in enzymes than that of a normal animal. It was not detd. whether or not a feeding after 1 or 2 days' inanition had any effect upon the secretion. C. J. WEST.

Proof that potassium increases the heart vagus tonus. H. E. HERING. Köln. *Arch. ges. Physiol.* **161**, 537–43(1915).—While the continuous infusion of small doses of KCl produces a negative chronotropic and a negative inotropic action upon the dog heart, the effect is positive after the vagus is cut. After vagotomy the same amt. of KCl will not produce a negative action, whether infused slowly or rapidly. This indicates that KCl increases the heart vagus tonus. C. J. WEST.

The stimulating action of potassium upon the mammal heart. H. E. HERING. Köln. *Arch. ges. Physiol.* **161**, 544–54(1915).—Infusion of KCl produces tachycardia

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in the dog, more easily in the rabbit. This tachycardia is extrasystolic (heterotropic); it is a secondary effect. The primary action of the KCl is a bradycardia. With somewhat larger doses "heart flutter" occurs. C. J. WEST.

Silicic acid content of the human pancreas, with remarks on the weight of the pancreas at various periods of life. HUGO SCHULZ. Univ. Greifswald. *Biochem. Z.* 70, 464–88(1915).—The av. wt. of the fresh pancreas is 56.82 g.; the av. male is 59.88, female 51.90. The av. content of dry substance is 18.74 g. The ash content averages 6.31, of which the silicic acid (SiO_2) makes up 0.207%. The SiO_2 content for 1 kg. dry substance is 0.1205 g. Figures are given for each of these values for each 10-yr. period up to 90 yrs. C. J. WEST.

Studies of metabolism in the dog before and after removal of the spleen. SAMUEL GOLDSCHMIDT AND RICHARD M. PEARCE. Univ. Penn. *J. Exp. Med.* 22, 319–32 (1915).—The removal of the spleen was not followed by any disturbances of N metabolism, fat utilization or Fe elimination. Two of the animals studied showed no anemia and the 3rd only a slight reduction in hemoglobin and number of red cells. A 4th animal, which developed a definitely progressive anemia of moderate severity, showed a slight loss of wt., a slight disturbance of N-balance and of creatine-creatinine partition, with a marked increase in the elimination of Fe. These disturbances were probably not due to the absence of the spleen but to the coexisting anemia. G. M. MEYER.

Acidity of the infant stomach. RUDOLF HESS. Univ. Strassburg. *Z. Kinderheilk.* 12, 409–39(1915).—In a large number of cases the acidity of the infant stomach is not sufficient for pepsin action. In breast-fed children there may be a short temporary degree of acidity the 1st few days, which may activate the pepsin. Usually the degree of acidity gradually increases until at the end of 9 mos. the necessary height for pepsin action has been reached. Such a degree is found earlier in breast-fed children than in those fed with substances known as secretory stimulants. C. J. WEST.

The origin of creatine. L. BAUMANN AND J. MARKER. Univ. Iowa. *J. Biol. Chem.* 22, 49–53(1915).—Perfusion of the isolated limb of a dog with defibrinated blood to which either arginine or methylureidoacetic acid was added, led to no certain increase in the creatine content of either the muscle or of the perfusate. I. G.

Physico-chemical regulation of respiration. HANS WINTERSTEIN. Univ. Rostock. *Biochem. Z.* 70, 45–73(1915).—Expts. are reported showing the results of infusions of acids (HCl, H_2SO_4, H_3PO_4, AcOH, CO_2 and lactic acid) and of NaOH into the blood and the simultaneous change in the lung ventilation, the H^+ concn. and the CO_2 tension of the blood. It is found that during acid infusion the increased lung ventilation, and during alkali infusion the decreased ventilation, are always related to a similar change in the H^+ concn. of the blood, while the CO_2 tension behaves quite differently (in acid infusion there is commonly a change in the opposite direction). This is a further proof of the theory that the CO_2 has no specific regulating action upon the respiration but that the chem. regulator is the H^+ concn. of the blood. C. J. WEST.

The respiratory dead space. Y. HENDERSON, F. P. CHILLINGWORTH AND J. L. WHITNEY. *Am. J. Physiol.* 38, 1–19(1915).—The dead space, *i. e.*, vol. of the mouth, pharynx, trachea, bronchi and bronchioles, was detd. by 5 methods: (1) Calcd. from CO_2 content of alveolar air, CO_2 of total expired air, and total vol. of expired air. (2) Calcd. similarly from the O values. (3) Calcd. from H values after inspiration of H. (4) and (5) Same as 1 and 2, resp., except total expired air was collected in a gas bag and the av. vol. of an expiration detd. as a mean. The dead space varies. With ordinary breathing it is about 150 cc., with shallower breathing it is less, with deeper breathing it is more, 400 to 600 cc., and with the very deepest breathing it may exceed

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1000 cc. The vol. is practically constant during rest and exercize. A diffusion of CO_2 from the walls of the dead space is indicated. J. F. LYMAN.

Variations in effective dead space in breathing. J. S. HALDANE. *Am. J. Physiol.* 38, 20–8(1915).—Results agree with those in the preceding paper. The increase in dead space during deep breathing is due to mechanical distention of the "atria" into which the terminal bronchioles open. J. F. LYMAN.

Acidity curves in the stomachs and duodenums of adults and infants, plotted with the aid of improved methods of measuring H-ion concentration. J. F. MCCLENDON. *Am. J. Physiol.* 38, 191–9(1915).—H^+ conc. of stomach contents was detd. (1) by means of a special electrometer in the stomach, (2) in gastric contents removed from time to time by a special stomach tube. H^+ conc. rizes rapidly during the first 1.5 to 3 hrs. after eating and then remains const. until the stomach is emptied. The max. H^+ conc. is constant for the individual (0.005 to 0.1 *N*), and somewhat higher than the normal values found by Michaelis and Davidsohn (0.0015 to 0.028 *N*). Duodenal contents are slightly alk. (H^+ conc. $= 2 \times 10^{-8}$ *N*). H^+ conc. of the infant's stomach rizes slowly during the first 15 to 60 min. after nursing and then rapidly until the stomach is empty. There is so little milk left in the stomach by the time the acidity has risen half way that peptic digestion in the stomach seems unimportant. The infant's duodenum is more acid than the av. acidity of the stomach and conditions of H^+ conc. here are as favorable for peptic activity as for tryptic. The action of various indicators to various H^+ concns. is tabulated. J. F. LYMAN.

G. PATHOLOGY.

H. GIDEON WELLS.

Puerperal osteomalacia. R. E. LIESEGANG. *Zentr. Gyn.* 39, No. 15; *Chem. Zentr.* 1915, I, 1136.—L. disproves objections raised against the general acid theory of osteomalacia. In accordance with the investigations of Hasselbalch and Gammeltoft, it is shown that the acid theory which holds good for pregnancy, is applicable also to puerperal osteomalacia. H. D.

Concentration of the protective bodies in antipneumococcus serum. Specific precipitate extracts. HENRY T. CHICKERING. Rockefeller Inst. Med. Research. *J. Exp. Med.* 22, 248–68(1915).—The protective substances contained in specific ppts. from antipneumococcus serum can be extd. by suitable chem. and physical means, dil. Na_2CO_3 at 42° being especially advantageous as an extractive agent. The resulting H_2O-clear exts., when made up to the original vol. of the serum used for pptn., protect animals almost as well as does the whole serum. The bacterial exts. used in pptg. the protective substances from the serum act specifically, that is, a bacterial ext. of pneumococcus of type I removes the protective substances from a type I immune serum only. In a polyvalent serum of type I and type II, the protective substances of each type may be removed independently of each other by the successive addition of the homologous antigens. Exts. of specific serum ppt. only 0.02 to 0.016 of the protein in the original serum, and about 0.5 the protein of the whole ppt. Exts. contain not only protective substances but agglutinins and precipitins. Exts. and whole ppts. not only confer passive immunity but stimulate the production of active immunity to pneumococcus infection in rabbits and mice. G. M. MEYER.

Function of the spleen in the experimental infection of albino mice with Bacillus tuberculosis. III. PAUL A. LEWIS AND ARTHUR GEORGE MARGOT. Univ. Penn. *J. Exp. Med.* 22, 359–65(1915).—In all probability the increased resistance to tuberculous infection which is imparted to mice by the removal of the spleen is a consequence of the loss of a function of the organ. This function can be restored by the feeding of fresh spleen. These changes may be attributed to the removal and restora-

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tion, as the case may be, of a particular substance for which the designation *tuberculosplenatin* is suggested. This substance is assumed to be related to the spleen as adrenaline is related to the adrenal gland. It is peculiar to the organ but not to the species. It is not found in other organs of the body so far as they have been studied. G. M. MEYER.

The diagnosis of typhoid fever in inoculated subjects. GEORGE D. DAWSON. Univ. Manchester. *Brit. Med. J.* 1915, II, 137.—The serum from 50 subjects vaccinated against typhoid failed to give positive agglutination with a strain of *B. enteritidis* isolated from a fatal case of food poisoning, but in 49 instances a positive test was obtained with this strain against serum from typhoid cases. These results give strong presumptive evidence that a vaccinated person whose serum agglutinates this particular strain of *B. enteritidis* is infected with typhoid (*B. typhosus* or a related organism). In 7 cases clinically typhoid *B. enteritidis* was agglutinated by the serum of each patient. *B. typhosus* was isolated from only 4 of these cases. In 7 other cases clinically doubtful, *B. typhosus* was not isolated in any instance and agglutination tests with *B. enteritidis* were negative. All 14 cases gave a positive Widal test. A. H. RAHE.

Causation and treatment of pellagra. THAD SHAW. *Med. Record* 88, 275–7 (1915).—Arsenic is of benefit in pellagra as a metabolic tonic. Six cases grew worse under auto-salvarsanized serum therapy. Skin lesions may abate after blood transfusion but mental symptoms remain unaffected. A. H. RAHE.

Complement-fixation in chicken sarcoma. CHARLES H. BAILEY. *Med. Record* 88, 403(1915).—Blood of chickens bearing sarcoma (Rous No. 1) did not exhibit complement-fixation, but fixation was obtained with the blood of pigeons inoculated with the same strain. These results suggest that this particular sarcoma is a true tumor and is not the result of infection with a filterable virus. A. H. RAHE.

Lange's colloidal-gold test as an adjunct to the diagnosis of cerebrospinal affections. A. I. RUBENSONE AND M. SCHWARTZ. Mt. Sinai Hosp. *N. Y. Med. J.* 101, 1273–4 (1915).—The technic of the method is given. It was tried on 26 cases of different affections and all gave positive results. M. RINGER.

Tests of renal permeability. ROBERT H. GATES. Fordham Univ. *N. Y. Med. J.* 102, 343–5(1915).—In diagnostic value the N test ranked first, the phlorhizin test second and the phenolsulfonephthalein test third. Delayed appearance of sugar in the urine following the administration of phlorhizin almost invariably indicates a diseased kidney or other abnormal condition. If one kidney is diseased and the other sound, ureteral catheterization following use of phlorhizin will locate the normal organ. The use of indigocarmin and methyl blue is also discussed. A. H. RAHE.

Rickets. WILLIAM L. ROST. *N. Y. Med. J.* 102, 505–8(1915).—The water-content of rachitic bones is above normal. The ash-content of the ribs and vertebrae in this disease is less than the normal by from 20 to 60%, the greatest deficiency being in Ca and P. In the acute stage the urine is faintly acid, with diminished Ca content, while the excretion of Ca in the feces in slightly increased. A. H. RAHE.

Fever studies. IV. Adrenaline fever. M. CLOETTA AND E. WASER. Zürich. *Arch. exp. Path. Pharm.* 79, 30–41(1915).—Thermoelec. measurements show that an intravenous injection of 0.2 mg. suprarenine into rabbits produces an increase in temp. of the fore brain after about 10 sec., and several sec. later an increase in the district of the temp. centers. The max. increase is about 0.6°, reached after 4 min. The temp. curve then begins to fall. Upon repeating the injection, the same result can be obtained. During this increase there is a decrease of the temp. of the skin. The intracerebral injection of $^1/_{15}$ mg. produces an increase without the corresponding fall. The removal of the fore brain has a decreasing effect upon the increase of temp.

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in the region of the temp. centers. The previous injection of ergotoxin does not influence the effect of suprarenine upon the brain. Ergotin considerably increases the fever-producing action of β-tetrahydronaphthalene. C. J. WEST.

Chemical change in the bile in liver intoxication and its importance in the pathogenesis of gall stones. LUIGI D'AMATO. Univ. Naples. *Biochem. Z.* **69**, 353–62 (1915).—Different liver poisons (mixts. of ether and amyl alc., acetic acid, butyric acid, cultures of *B. coli*), produce an increase in the content of nucleoprotein, which normally is from 0.7 to 1.47%, to 5 or more times that amt., a decrease of the salts of gallic acid and, to a lesser extent, of the free and bound cholesterol. The increase of the nucleoprotein and the decrease of the gallic acid salts are both favorable to the excretion of cholesterol and thus to the formation of gall stones. C. J. WEST.

Further concerning the Abderhalden reaction. HELMUTH THAR AND NINA KOCHNEV. Petrograd. *Biochem. Z.* **69**, 389–402(1915); cf. *C. A.* **8**, 3572.—Applying the earlier method to other objects the following results were found: Placenta protein is not decompd. by the serum of normal men. Serum of pregnancy decomps. placenta-, carcinoma-, and lung-proteins. Placenta protein was decompd. by nephritic serum. Brain protein was decompd. by the serum of progressive paralysis but not by that of weak-minded people. Carcinoma protein was decompd. by the serum of individuals having carcinoma. In spite of the decompns. found, the ninhydrin reaction was negative unless the concn. of the decompn. products reached a certain limit, which corresponds to about 0.015–0.016 mg. amino N. Placenta- and lung-proteins were decompd. by the placenta press-juice while carcinoma protein was not. T. and K. believe that in pregnancy the placenta cells coming into the blood stream bring with them the enzymes which cause the destruction of the placenta and lung proteins, and that they are not therefore to be considered as protective enzymes. C. J. WEST.

New investigations concerning the behavior of the blood sugar after venesection. ERNST HIRSCH. Prag. *Biochem. Z.* **70**, 191–212(1915).—A single large venesection, one in which at least 50 cc. is withdrawn, causes, in a healthy, well nourished rabbit, little or no increase of the blood sugar. Repeated, this leads, without exception, to an increase in the blood sugar concn., the values reaching 0.24 to 0.31%. In this case it is not so much the number of venesections as the amt. of blood taken out at one time. Repeated small venesections, even if the total amt. of blood is large, 118 cc. in one case, does not lead to hyperglucemia. The increased blood sugar occurs during or soon after the venesection; the max. is reached after 45 min. and then gradually falls to the normal value during 2 or 3 hrs. A single large venesection in a rabbit which had been made anemic by previous loss of blood produces a considerable increase in the blood sugar concn. In animals which have been starved 5 or 6 days, repeated venesection leads to a noticeable increase of blood sugar. If very large amts. of blood are not removed, the hyperglucemia appears to be less than in the normal animal. Here the first venesection leads to hypoglucemia and hyperglucemia results only if considerable amts. of blood are removed. In animals which have been fed with carbohydrates the production of an increased concn. of sugar after venesection is easy; the hyperglucemia is correspondingly higher and is followed by glucosuria. Glucosuria is found only if the blood sugar reaches a concn. of 0.27%. C. J. WEST.

The inactivation of the serum by cobra poison. L. HIRSCHFELD AND R. KLINGER. Univ. Zürich. *Biochem. Z.* **70**, 398–415(1915).—Addition of 1 drop 1% cobra poison completely suppresses the cytozymic action of heart ext., aq. ext. of ox blood plates, alc. liver ext. and lecithin, but not that of Na oleate. This action with Na oleate is due to the capacity of cobra poison to increase the activity of the thrombin already present and not to an increased thrombin formation. The hemolytic action is only slightly weakened by boiling in neutral or acid soln. but is completely destroyed in

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alk. soln. There is a very pronounced heat-sensitiveness of those components of the poison which destroy the complement of the serum. The poison heated to 100° is not capable of markedly injuring the complement function of the serum. The same effect is brought about by allowing the poison to stand with very dil. HCl and then carefully neutralizing the acid. This seems to indicate that the lipolytic and complement-destroying actions of the poison are different processes. In citrate medium the complement is not essentially weakened by cobra poison even after a long period of time. From other expts. reported it is concluded that the striking change of the serum by cobra poison is not due to the chem. destruction of a definite substance (by lipase action) but to a change of the globulins, as this is caused, very similarly, by a series of agencies such as the addition of H_2O, of different suspensions, by shaking, etc. This is further supported by the fact that all these complement-destroying factors are influenced in the same way by hypertony and by weakly ionized salts. This conclusion makes the hypothesis of a third component of the complement lose some of its probability. C. J. WEST.

Alkalinity of the blood in kala-azar and cholera and the technic of its estimation. LEONARD ROGERS AND A. J. SHORTEN. Med. College, Calcutta. *Indian J. Med. Res.* 2, 867–81(1915).—The method of Wright was used. Figures are given for about 20 cases of each disease. In cholera there is a constant reduction of the alkalinity of the blood; this is very marked in all but the very mildest cases. C. J. WEST.

Artificial production in mammalian plasma of substances inhibitory to the growth of cells. ALBERT J. WALTON. London Hosp. *J. Exp. Med.* 22, 194–203(1915).—Active immunity to the growth of tissue may be obtained by intraperitoneal injections of tissue emulsions. This immunity is of short duration and is followed by an anti-immunity. The immunity varies for individual tissues both in extent and in the time of onset. It is not specific in so far that it is not more marked for the tissue similar to that forming the emulsion. G. M. MEYER.

Experimental alimentary atherosclerosis. E. C. VAN LEERSUM. Leyden. *Arch. Path.* 217, 452; *Zentr. Biochem. Biophys.* 17, 653(1915).—L. was unable to produce alimentary atherosclerosis in rabbits by feeding liver and meat, although a considerable increase in blood pressure was observed when liver was fed. From the results of his own expts., as well as by calcn. from the observations of other investigators, L. concludes that spontaneous rabbit atherosclerosis (upon which he lays great emphasis) has been observed in about 3% of all rabbits investigated. Feeding of cholesterol and egg yolk did not always give the same result. H. S. PAINE.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

The value of gold cyanide in the chemotherapy of tuberculosis. J. SCHUMACHER. *Dermatolog. Z.* 22, 10–25(1915); *Chem. Zentr.* 1915, I, 1180–1.—The observed therapeutic action resulting from the use of gold cyanide is not to be attributed to it as such, but apparently to the colloidal gold which is formed in the body through decompn. of the gold cyanide. In favor of this supposition is the fact that gold cyanide possesses no particular disinfecting power and that it splits up, in the body, and forms gold albuminates, which then give rise to colloidal gold. It is improbable that the CN radical exerts any action since it is so readily changed into the non-poisonous thiocyanate combinations. Favorable therapeutic action is to be expected from prepns. which will break up readily and furnish sufficient amounts of colloidal gold. H. D.

The residual valency of anesthetics and its importance in anesthesia. A. P. MATHEWS. *Intern. Z. phys. chem. Biol.* 1, 433–49(1914); *J. Chem. Soc.* 108, I, 106.—M. holds that the union between protoplasm and anesthetic is due to the residual

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valency, and is of the nature of a mol. union. It has been found that a general parallelism exists between the anesthetic power and the amt. of residual valency. The theory of anesthesia advanced is that the irritable substance of protoplasm is a mol. oxygen-protoplasmic union, or a peroxide union, unstable and similar to oxyhemoglobin. On stimulation, the unstable mol. union passes by rearrangement of the mols. into a stable form, oxidation taking place and CO_2 being produced. The anesthetic produces anesthesia by occupying the oxygen receptors of the cell, thus forming a non-irritable, dissociable, anesthetic protoplasmic compd. H. D.

Effect of epinephrine on heart rate. W. J. Meek and J. A. E. Eyster. *Am. J. Physiol.* **38**, 62–6(1915).—Intravenous injections of physiol. amts. of epinephrine into unanesthetized dogs with good vagal tone invariably caused a decrease in heart rate. The action of epinephrine appears to be 2-fold: it accelerates the heart by direct stimulation and inhibits reflexly through the vagus. An accelerated pulse follows moderate exercize; this is not due to a secretion of epinepherine. When work is pushed to an extreme degree the accelerating effect of epinephrine may become predominant. J. F. Lyman.

Influence of diiodotyrosine and iodothyrin on the secretion of cerebrospinal fluid. C. H. Frazier and M. M. Peet. *Am. J. Physiol.* **38**, 93–7(1915).—Intravenous injections of diiodotyrosine have an inhibitory influence on the rate of secretion of the choroid plexus, but less marked than that obtained with saline exts. of fresh thyroid. Iodothyrin in small amts. (0.05 g. per dog) has little influence; in larger amt. (0.3 g. to 0.5 g.) there is some inhibition in the rate of the secretion. Cf. *C. A.* **9**, 1933. J. F. Lyman.

Effect of irritation on the permeability of the meninges for salvarsan. Edgar Stillmann and Homer F. Swift. Rockefeller Inst. Med. Research. *J. Exp. Med.* **22**, 286–91(1915).—The subdural injection of normal salt soln., normal serum, serum salvarsanized *in vivo*, or weak solns. of $Hg(CN)_2$, does not demonstrably increase the permeability of the spinal cord or brain for salvarsan which is circulating in the blood at the time of the subdural injection. G. M. Meyer.

Change in the composition of the blood and the brain in the chronic use of hypnotics. Ernst Waser. Univ. Zürich. *Z. physiol. Chem.* **94**, 191–204(1915).—A study was made of the chem. changes in the compn. of the blood and brain after continued use of chloral hydrate, paraldehyde and veronal. The following figures for the brain represent the values found for (1) normal, (2) paraldehyde, (3) veronal-Na, (4) chloral hydrate: dry substance, 247.19, 217.79, 219.95, 220.50; ash, 16.18, 15.03, 13.58, 14.55; total fat (lipoid), 105.60, 92.82, 103.62, 100.65; free cholesterol, 17.50, 15.92, 16.84, 18.12; bound cholesterol, 5.47, 3.68, 6.93, 6.88; cholesteryl palmitate, 8.84, 5.95, 11.20, 11.12; P_2O_5, 5.22, 5.88, 5.06, 4.28; lecithin, 59.35, 66.87, 57.46, 48.60; N, 1.86, 2.14, 2.61, 2.68. The figures for the blood represent (1) normal, (2) paraldehyde, and (3) veronal-Na: Total fat, 5.051, 8.42, 8.588; free cholesterol, 0.84, 0.747, 0.658; bound cholesterol, 0.424, 0.181, 0.846; cholesteryl palmitate, 0.686, 0.292, 1.367; P_2O_5, 0.219, 0.346, 0.321; lecithin, 2.493, 3.933, 3.651; N, 0.1439, 0.1728, 0.2899. As far as the effect on the brain is concerned paraldehyde is the best hypnotic. If general conditions are considered, however, veronal is best. G. M. Meyer.

Salt and diuretin hyperglucemias. Ernst Hirsch. Wiesbaden. *Z. physiol. Chem.* **94**, 227–63(1915).—The injection of large amts. of physiol. NaCl soln. (up to 570 cc. 0.85%) does not cause a noticeable increase in the blood sugar in rabbits not tied nor in bound rabbits after the disappearance of the initial hyperglucemia and glucosuria. The highest value was 0.19%. After intravenous injection of large amts. of 2.5% NaCl, the blood sugar value reached 0.19% with no glucosuria. Ten % NaCl regularly produced a high increase in the concn. of the blood sugar (up to 0.35%)

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and glucosuria. The cause of this glucosuria is not in an increased permeability of the kidney (Underhill and Classen) nor in the increase of the blood pressure and diln. of the blood serum. The polyuria is probably purely salt action and has nothing to do with the glucosuria. The glucosuria is the result of hyperglucemia. Intravenous injection of 2 and 2.5% Na_2CO_3, 1 and 2% NaOAc and 1% $CaCl_2$ solns. has no effect upon the blood sugar concn. in the rabbit. The intravenous injection of relatively small amts. of 1% $MgSO_4$ soln. produces a considerable increase of blood sugar and leads to glucosuria. The production of marked hyperglucemia is accelerated by liberally feeding the animals 2–3 hrs. before the expt. with carbohydrate (best with carrots). The same result is produced by intravenous injection of diuretin. The intravenous injection is far more effective than the subcutaneous, fractionally subcutaneous or intramuscular forms. The repeated intravenous injection may produce a further increase of blood sugar. The degree of hyperglucemia or glucosuria does not depend on the dose of injected diuretin. There seems to be more of an individual relationship. Glucosuria first occurs when the blood sugar content is at least 0.27%. Diuretic glucosuria is not concerned with kidney diabetes for, in order that the sugar may pass from the blood to the urine, the above concn. of blood sugar is necessary. The glucosuric action of diuretin is not directly related to the diuretin, for even after subcutaneous injection it leads to polyuria but not to glucosuria. Diuretin hyperglucemia is started by the central nervous system and is considered as a symptom of the generally increased reflex activity of the nervous system which is produced by diuretin. G. M. Meyer.

Action of epinephrine on the brain. Alexander Bass. Berlin. *Z. ges. Neurol.* **26**, 600(1914); *Zentr. Biochem. Biophys.* **17**, 639–40(1915).—B., in conjunction with Levandovski, found that the direct action of epinephrine on the spinal cord (by means of lumbar injection) resulted in spasm and tremor of the musculature. B. has further studied the effect of epinephrine in the case of direct action on the brain. Epinephrine was injected under the dura mater (sometimes deeper in the brain) of dogs. A remarkable soporific effect was observed; the animals passed almost immediately into a deep narcosis with quiet respiration. The tendon and corneal reflexes were retained. The phenomenon was apparently more of the nature of natural sleep than of true narcosis; the period of sleep was 2–5 hrs. A considerable decrease in temp. was also observed. B. could find no basis for attributing the above condition to a change in the lumen of the cerebral vessels. H. S. Paine.

Poisoning by inhalation of methyl alcohol. H. H. Tyson and M. J. Schoenberg. *Sect. Ophth. Am. Med. Assoc.* June, 1914; *Klin. Monatsbl. Augenheilk.* **53**, 252(1914); *Zentr. Biochem. Biophys.* **17**, 663(1915); cf. *C. A.* **8**, 3595.—Pronounced manifestations of poisoning were observed in dogs, rabbits, guinea pigs and monkeys which were placed in a space in which MeOH was vaporized. The effect on the eye consisted of irritation of the conjunctiva and cornea, hyperemia and edema of the papillae with dilatation of the blood vessels. Coma with moderate myosis and fixed gaze, and pronounced hypotony in severe cases, was observed. The aq. humor acquired an acid reaction. Blindness ensued in some instances. Degeneration of the retinal ganglionic cell layer occurred. H. S. Paine.

Paralysis of the sixth pair of nerves, associated with bilateral deafness, after rachistovainization. F. Terrien and P. Prélat. *Arch. ophth.* **34**, 111(1914); *Zentr. Biochem. Biophys.* **17**, 664(1915). H. S. Paine.

Immediate effects of the inhalation of chlorine gas. Edward Schäfer. Univ. Edinburgh. *Brit. Med. J.* **1915**, II, 245–7.—Dogs, rabbits and cats were caused to inhale air having a Cl content varying from 1 to 20%. Even when only 1% of Cl was present, inspiration was deepened and finally arrested. The pulse rate slackened;

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blood-pressure, after a preliminary rise, fell rapidly. When more than 5% of Cl was inhaled, recovery under artificial respiration did not occur. Death seemed to have been due to obstruction of the pulmonary vessels amounting at times to a complete statis, since perfusion of the lungs both with the air-Cl mixt. and with Cl added to Ringer soln. caused no constriction of the bronchioles. A. H. RAHE.

Influence of intravenous injections of neo-salvarsan on the arterial blood-pressure. H. D. ROLLESTON. *Brit. Med. J.* 1915, II, 281–2.—Intravenous injection of neo-salvarsan, in persons suffering from syphilis, lowered blood-pressure. A. H. RAHE.

The use of certain antiseptic substances in the treatment of infected wounds. H. D. DAKIN. New York. *Brit. Med. J.* 1915, II, 318–20.—The destruction of bacteria when mixed with blood, pus, etc., is attained with difficulty owing to the fact that antiseptics act not only on the bacteria but upon other protein substances as well. Phenol, H_2O_2, $HgCl_2$, $AgNO_3$, I and NaClO as ordinarily prepared are of limited value in the treatment of wounds, but a soln. suitable for direct application may be obtained by dissolving 140 g. dehydrated Na_2CO_3 in 10 liters of tap water, adding 200 g. chloride of lime and shaking. After the suspended matter has settled the clear liquid is siphoned off, filtered and 40 g. boric acid added. A. H. RAHE.

Syphilitic reinfection, with notes on immunity and treatment. F. W. SMITH. *Med. Record* 88, 60–2(1915).—The Wassermann test tells not only whether the patient has syphilis but the degree of infection and the amt. of natural resistance. Salvarsan or neosalvarsan should be given intravenously every week or 10 days, for at least 6 injections. Hg in some form should be given between injections. A. H. RAHE.

Chemical and pathological observations in a case of mercury poisoning. MAX KAHN, VERNON L. ANDREWS AND J. H. ANDERSON. *Med. Record* 88, 357–8(1915).—During the several days that the patient survived the effects of $HgCl_2$ there was constant polycythemia (7,570,000), a white-cell count of 27,100 and a hemoglobin value of 137 per cent. A large quantity of $HgCl_2$ was recovered from the large intestine before death. At autopsy the greatest amt. of the poison was found in the liver. A. H. RAHE.

Syphilis of the nervous system. WILLIAM V. P. GARRETSON. *New York Med. J.* 102, 126–9(1915).—G. is convinced that in the majority of cases of neurological syphilis more satisfactory and reliable results can be obtained from KI and Hg than by use of salvarsan *alone*. Salvarsan is at best only an adjuvant in treatment of neuro-ogical syphilis. A. H. RAHE.

Irritation of the kidneys after novocaine anesthesia. R. MORIAN. *Zentr. Chirurgie* 42, No. 28(1915); *J. Am. Med. Assoc.* 65, 751.—In from 5 to 10% of the cases in which M. used novocaine albumin was found in the urine within a few hrs. after the injection, and could be detected up to a max. of 49 hrs. The amt. ranged from traces to 0.5 per thousand. Blood pressure was unaffected. L. W. RIGGS.

Thyroid secretion in normal and pathologic conditions. N. E. OSSOKIN. *Russ. Vrach.* 14, No. 13(1915); *J. Am. Med. Assoc.* 65, 836.—Epinephrine increases the secretory activity of the thyroid. After its prolonged use the gland becomes exhausted with subsequent atrophy of the cellular elements. L. W. RIGGS.

Aniline poisoning. J. DE HARTSOUGH, JR. *Nederlandsch. Tijdschrift Geneeskunde*, July 10, 1915; *J. Am. Med. Assoc.* 65, 913.—A young man in robust health, after wearing for 90 min. a pair of new gymnasium slippers, which had been colored black the day before, was seized with headache, vomiting and delirium; his lips, nails and skin became cyanotic, and his pulse and respiration were accelerated. Recovery gradually followed. L. W. RIGGS.

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Elimination of hexamethylenetetramine in diseases of the urinary passages in children. A. CORICA. *Pediatria* 23, No. 7(1915); *J. Am. Med. Assoc.* 65, 913.—In 11 healthy children the drug was found in the urine within 30 min. and the elimination continued from 20 to 33 hrs. In 5 children with nephritis the drug appeared in the urine in 30 min., but the elimination continued from 46 to 85 hrs. In 5 other cases of post-scarlatinal or acute nephritis, comparative tests were made with $(CH_2)_6N_4$, lactose and I. The elimination of lactose and of I was prolonged in these cases over the time required in healthy children. C.'s expts. have convinced him that $(CH_2)_6N_4$ is eliminated through the glomeruli. In general its action is favorable. L. W. RIGGS.

Mercuric chloride poisoning. A. F. SOER. *Nederlandsch. Tijdschrift Geneeskunde* July 17, 1915; *J. Am. Med. Assoc.* 65, 914.—Two cases confirm anew that when complete anuria appears in $HgCl_2$ poisoning, death follows in 1 or 2 weeks, whether or not there are any signs of uremia. L. W. RIGGS.

Icterus from the absorption of picric acid, and its differentiation. M. WAHL. *Presse medicale* 33, No 16(1915); *J. Am. Med. Assoc.* 65, 984.—Picric acid in urine reacts to various tests exactly like bile pigments. The symptoms induced by its absorption resemble those of catarrhal jaundice. Monkeys injected subcutaneously with picric acid eliminated the drug within a short time, but it could not all be recovered, a part evidently being eliminated in some other form. L. W. RIGGS.

Influence of anesthesia on the liver. J. FUNKE. Atlanta Coll. of Physicians and Surgeons. *Pub. Jefferson Med. Coll. and Hosp.* 6, 45–53(1915).—The glycogenic content of the liver is diminished during ether administration; the reason for this is not well understood. R. L. SIBLEY.

The effect of an anesthetic on the liver. M. A. SAYLOR. *Pub. Jefferson Med. Coll. and Hosp.* 6, 54–60(1915).—Samples of liver were taken from 5 dogs immediately after etherizing and after being under the influence of the anesthetic for from 2 to 5 hrs. The samples were finely ground and allowed to stand under 95% alc. for several weeks. They were then extd. for 3 hrs. with 95% alc., 2 hrs. with ether and after powdering were again extd. with 95% alc., this time for 15 hrs. The exts. were united and evapd. and the residue weighed. The insol. residues were analyzed for P and S. The ext. was examd. for lipoids and for P and S. There was destruction of compound proteins as was shown by a decrease in the P content. R. L. SIBLEY.

Narcosis. III. Narcosis and suffocation. HANS WINTERSTEIN. Univ. Rostock. *Biochem. Z.* 70, 130–43(1915); cf. *C. A.* 8, 2002.—A somewhat noticeable decrease of the oxidation processes is a secondary phenomenon, which cannot serve as an explanation of the mechanism of narcosis. Narcosis does not prevent either the collection of acid suffocation products occurring during a lack of O nor their removal by the addition of O. Narcosis is neither a suffocation nor does it lead to such if long continued. Narcosis does not prevent the occurrence of suffocation because of a lack of O but probably does prevent the recovery from the same through addition of O. C. J. WEST.

Comparative investigation of the toxicity of arsenious acid and arsenic acid. GEORG JOACHIMOGLU. Univ. Berlin. *Biochem. Z.* 70, 144–57(1915).—The fact that H_3AsO_4 is far more poisonous than H_3AsO_3 was established by intravenous injection of the corresponding Na compds. into rabbits. The ratio is about 6 to 10. The H_3AsO_4 is about 300 times more poisonous to the isolated frog heart than is the H_3AsO_3. The small intestine of the rabbit behaves in the same way though the difference is not quite so marked. It is probable that the toxicity of the H_3AsO_4 is not due so much to the acid itself as to the reduction to H_3AsO_3. C. J. WEST.

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Quantitative relationship between the brain lipoids in a dog accustomed to morphine. JOHANNES BIBERFELD. Univ. Breslau. *Biochem. Z.* 70, 158–63(1915). —There is no quant. change in the lipoids of the brain of a dog which is resistant to a dose of 2.5 g. morphine. C. J. WEST.

Action of colchicine upon the intestine. H. FÜHNER AND M. REHBEIN. Univ. Freiburg i/B. *Arch. exp. Path. Pharm.* 79, 1–18(1915). C. J. WEST.

Digitalis action upon the isolated frog auricle. WALTHER STRAUB AND S. YAGI. Univ. Freiburg i./B. *Arch. exp. Path. Pharm.* 79, 19–29(1915).—The concn. of poison, which is fatal to the auricle, is at least ten times greater than that necessary to kill the ventricle. The elementary action of the substances is discussed. C. J. WEST.

Distribution of neuronal, bromural and adalin in the organism. P. GENSLER. Zürich. *Arch. exp. Path. Pharm.* 79, 52–54(1915).—The brain possesses a relatively greater adsorption capacity for the hypnotics of the fatty series than any other of the body tissues. The abs. amt. which is taken up by the brain is very small (23 mg. neuronal, 38 mg. bromural and 45 mg. adalin) per 100 g. brain substances. This amt. is only 1.4% (average) of the resorbed amt. There is no destructive action of the brain upon the substances. The amt. of the various hypnotics found in different brains is parallel to the wt.; calcd. upon 100 g. brain they are rather constant. Of the less active hypnotics, of which larger amts. must be given in order to produce the same degree of sleep, a correspondingly larger amt. is found in the brain. C. J. W.

Method of action of synergetic drugs. I. G. MANSFELD. Univ. Budapest. *Arch. ges. Physiol.* 161, 444–60(1915).—The minimal active dose of $MgSO_4$ is 0.45 g. per kg. rabbit. Using this amt. $MgSO_4$, 0.1 g. urethan will produce complete narcosis while 0.2 g. will kill the animal. If the urethan is administered first and after narcosis $CaCl_2$ is injected, there is almost complete recovery from the narcosis; if, however, the $MgSO_4$ is given first the subsequent administration of $CaCl_2$ has little or no effect upon the narcosis. It is concluded that the potential action of the Mg is due to the fact that it changes the distribution of the urethan in the organism, so that more urethan reaches the elements sensitive to the poison. The completely inactive dose of chloral hydrate is 0.1 g. per kg. rabbit. Mg has the same effect here as with urethan. This couple is not suitable to prove the above conclusion since the characteristic "ear-reflex" of chloral is destroyed by an excess of $CaCl_2$. A positive result was obtained with the combination ether-chloral hydrate. II. STEPHAN HAMBURGER. Univ. Budapest. *Ibid* 461–6.—The above effect is demonstrated for the combination ether-morphine; a rabbit, slightly under ether, when injected with an inactive amt. of morphine, remains narcotized after the ether is removed from the system. The ether influences the distribution of the morphine throughout the system. C. J. WEST.

Ineffectiveness of antipyretics against adrenaline. G. MANSFELD AND B. PURJESZ. Univ. Budapest. *Arch. ges. Physiol.* 161, 506–15(1915); cf. Starkenstein, *C. A.* 6, 1780.—Since the glucosuric action of adrenaline is inconstant, not only in different animals but in the same individual, the degree of sugar excretion is not a suitable measure of the retardation or acceleration of the action of adrenaline. In nearly all expts. the adrenaline diabetes in a given animal was weaker on those days in which the animal was previously treated with an antipyretic; this confirms Starkenstein's conclusion. But that antipyretics are not antagonistic to adrenaline follows from expts. in which the adrenaline hyperglucemia was identical in animals before and after treatment with antipyrine. C. J. WEST.

Behavior of the chondriosomes of the kidney cells in the so-called fatty degeneration after phosphorus poisoning. AZZO AZZI. Naples. *Zentr. Pathol.* 25, 727(1914);

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Zentr. Biochem. Biophys. 17, 640–1(1915).—The Os reaction which is so characteristic of true fats only commences to be positive when the chondriosomes have undergone considerable morphological changes and have shown a tendency to assume a globular form. At the same time these elements of mitochondric origin lose the property of being fixed by Pt and Cr salts; the granules are not detectable by fat solvents either in the case of preliminary or subsequent treatment with these reagents. Acetone dissolves and destroys these granules, which further lose their affinity for the dyes which cause selective staining of the chondriosomes themselves. The large, globular granulations which finally replace the chondriosomes are stained red by Sudan. A. concludes that the chondriosome-lipoids are transformed into true fats in P poisoning, although he leaves it undecided whether a fat infiltration takes place at the same time and contributes to the enlargement of the transformed autochthonous fat droplets.

H. S. PAINE.

Numerical laws governing the rate of excretion of urea and chlorides in man. II. Influence of pathological conditions and of drugs on excretion. FRANKLIN C. MCLEAN. *J. Exp. Med* 22, 366–88(1915).—The rate of excretion of urea in diseased conditions may be measured in terms of the normal by the index of urea excretion and direct evidence as to the state of 1 of the more important excretory functions may be thus obtained. The rate of excretion of chlorides gives a basis for calcg. the theoretical concn. of chlorides in the plasma. By comparing the concn. actually found with the theoretical concn., changes in the function of chloride excretion may be studied. Increased concn. of urea in the blood is, as a rule, a compensatory phenomenon, in order to provide sufficient pressure to cause its excretion through a damaged outlet. Under certain conditions actual accumulation occurs. Relatively increased concn. of chlorides in the plasma occurs in certain conditions, especially in certain forms of cardiac and renal diseases. In fevers and in diabetes or by the action of diuretics (digitalis) the chloride threshold may be temporarily or permanently lowered. This may result in a decrease in the concn. of chloride in the plasma to a point lower than the normal minimum. Failure to excrete chlorides in pneumonia is associated with a lowered concn. of chlorides in the plasma. Excretion begins at the time this concn. increases. Edema is usually accompanied by a relatively increased concn. of chlorides in the plasma. The relations ordinarily return to the normal state when edema disappears. Chlorides and urea functions may be quite independent of one another. (Cf. *C. A.* 9, 2928.) G. M. MEYER.

Studies in liver and kidney function in experimental phosphorus and chloroform poisoning. E. K. MARSHALL AND L. G. ROWNTREE. Johns Hopkins Univ. *J. Exp. Med.* 22, 333–46(1915).—The results of previous workers on tetrachlorophthalein, fibrinogen and lipase have been confirmed. The total non-protein N, urea and amino acids show a definite and sometimes marked increase in P poisoning. These changes are not so evident in $CHCl_3$ poisoning although they sometimes occur. They are usually terminal phenomena. The urinary N partition between the urea, NH_3 and amino acids is not always disturbed. The most important changes which occur are an increased amino N in $CHCl_3$ and P poisoning and a very low urea N percentage in fatal $CHCl_3$ poisoning. Sugar tolerance towards galactose and levulose is in general markedly decreased in both types of poisoning. In P poisoning liver functional changes can and do occur without concomitant renal changes. Increased nitrogenous products in the blood (total non-protein N, urea, and amino N) are associated with an increase of these compds. in the urine. Consequently, an increased catabolism, as well as renal insufficiency, is necessary to explain this accumulation. A terminal acidosis, as evidenced by an increased H-ion concn. in the blood, usually occurs. G. M. M.

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I. ZOÖLOGY.

R. A. GORTNER.

Rythmic pulsation of the cloaca of Holothurians. W. J. CROZIER. *Science* 41, 474(1915).—The rate of pulsation of the isolated cloacal extremity of *Stichopus moebii* was found to have a temp. coeff. of about 2.4; it was capable of long continuance in water practically free from dissolved O. The coördinating mechanism was much more affected by nicotine and atropine than by cocaine or morphine. The duration of pulsation and of irritability to mechanical stimulation in dild. sea water was proportional to about the square of the concn. The alkali chlorides preserved pulsation and irritability in the order $NaCl > LiCl > NH_4Cl > KCl$. The brownish skin pigment was given out under abnormal ionic or osmotic conditions. L. W. RIGGS.

Chemistry of the echinodermata. A. KOSSEL AND S. EDELBACHER. *Z. physiol. Chem.* 94, 264–83(1915).—The *histone* from the testicles of *Astropecten aurantiacus* was isolated by first extg. with alc. and Et_2O, then with 1% H_2SO_4 and pptg. with alc. The sulfate was pptd. from H_2O as the picrate and then reconverted into the sulfate. It forms a H_2O-sol. powder. The soln. is pptd. by NH_3. It gives the biuret reaction and a red color with Millon's reagent. While it gives a red color with diazobenzenesulfonic acid, this is not due to histidine. Dried at 100° it contains 15.83% N and 12.28% H_2SO_4. Of the total N, 0.9% is NH_3, 3.7% "histidine fraction," 19.4% arginine, 11.5% lysine (as picrate), 39.2% "monoamino acids" (part not pptd. by phosphotungstic acid). The histone obtained from *Echinus acutus* and *Strongylocentrotus lividus* had essentially the same properties. Among the substances found in the free state in the testicles and ovaries are: taurine, glycocoll, sarcosine, isoleucine, tyrosine, glutaminic acid. *Stellasterin*, $C_{27}H_{44}O$, is obtained from the Et_2O-sol. part of the hot alc. ext. by sapon. It is isolated by pptg. with digiton, transformation into the acetate and sapon. with dil. alc. KOH. It m. 149–50°, gives the Liebermann-Burchardt test, gives a yellowish red color with $CHCl_3$ and concd. H_2SO_4, does not give a difficultly sol. Br deriv. *Acetate*, m. 176–7°. *Benzoate*, shows a double m. p., 100° and 125°. *Astrol*, $C_{32}H_{48}O_3$, isolated from the Et_2O ext. of the difficultly alc.-sol. portion of the cecum tissue, needles, m. 71°, does not give the Liebermann or Salkowski test. G. M. MEYER.

Reaction of herring and other salt water fishes to decomposition products normal to sea water. V. E. SHELFORD. *Science* 41, 475(1915).—Herring are very sensitive to H_2S and CO_2, dying very quickly in small quantities of the former and more quickly than fresh water species in fatal concns. of the latter. They turn back upon encountering H_2S in sea water, and react to H ions, selecting essential neutrality with precision and showing sensitiveness equal to litmus. When differences of acidity are present they do not react to differences in salinity and density. They react to differences in temp. as small as 0.2°. L. W. RIGGS.

The reflex action of the oxygen content of the water upon the respiration of fishes. JOSEF PETRIK Univ Prag. *Arch ges. Physiol.* 161, 555–76(1915). C. J. W.

The coefficients of the osmotic pressure of Bombyx mori L. during the entire period of its development. Osw. POLIMANTI. Univ. Perugia. *Biochem. Z.* 70, 74–92(1915). C. J. WEST.

Quinoidine: its characters, composition and lethality to protozoa. A. C. MACGILCHRIST. *Indian J. Med. Res.* 2, 888–906(1915).—A rough analysis of com. quinoidine gave the following results: Total alkaloids, about 75% (chiefly diquinicine and dicinchonicine, with a small amt. of cinchonicine and traces of cinchonine), non-alkaloidal organic matter, 8%; moisture, 15% and ash 0.7%. The name "amorphous alkaloid" should not be applied to quinoidine or residual alkaloid. Commercial or

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even pure quinoidine alkaloid is not nearly so lethal to *Paramecium* and other protozoa as is quinine-HCl. The next paper will show that quinoidine is much inferior to quinine as an antiprotozoal or anti-malarial agent. C. J. WEST.

12. FOODS.

W. D. BIGELOW, F. F. FITZGERALD.

Coloring matters in foodstuffs. New Canadian regulations. *Chamber of Commerce J.*, July, 1915; *J. Soc. Chem. Ind.* 34, 813.—New regulations governing the use of coloring matter in foods have been promulgated under the Canada Adulteration Act by an Order of January 9, 1915. It is provided that the following articles may be artificially colored, if only harmless coloring matter is used, without a declaration to that effect on the label or elsewhere, although such coloring substance shall in no case be employed to conceal damage or to appear to enhance the value of the product: Full whole-milk cheese; confectionery, including jelly powders; flavoring ext. of lemon; ice cream and ices; butter. In the case of spirits, vinegar, sauces, fermented beverages not subject to excize requirements, and so-called "temperance" beverages, the use of caramel only is permitted without declaration of such coloring. The use of art. color must be stated on the label in easily legible type in the case of all other food products. The following substances are provisionally considered to fall within the definition of harmless coloring materials: Caramel, cochineal, saffron, chlorophyll and innocuous vegetable color extractives, certain coal-tar dyes not contg. As in excess of 10 parts As_2O_3 per million, calcd. on the actual wt. of coloring matter, and not contg. heavy metals (except Fe), when used in quantities not exceeding 2 grains per lb. (1 part in 3500). The use of Cu salts in the greening of peas is permitted, provided the amt. of Cu (expressed as metallic Cu) in the peas does not exceed 80 parts (by wt.) per million in the drained peas or 10 parts per million in the liquid. E. J. C.

Microscopy of pepper and its adulterations. P. POOTH. *Mikrokosmos* 1915–6, 96–9.—In making sections for purpose of microscopical examn. it is recommended first to soak the pepper in a soln. of $CCl_3CH(OH)_2$. A large number of substances are used as adulterants, some of which are mentioned and the method of detection explained. C. A. NOWAK.

Composition of some of the less common spices. W. SUTTHOFF. Munster. *Z. Nahr.-Genussm.* 30, 27–30(1915).—Analyses are given of a few samples of cumin seed, mother of cloves, cassia flowers and calamus root. A. F. SEEKER.

A new method for the detection of shells in cocoa. R. WASICKY AND C. WIMMER. *Z. Nahr.-Genussm.* 30, 25–7(1915).—The method is based upon the difference in appearance between shell and nib tissue when viewed through a microscope by ultraviolet light. The proper light is best obtained by means of a carbon-iron arc lamp, the light before reaching the mount being passed through a Wood-Lehmann filter (two blue Uviol glass cells, one filled with 1:12000 nitrosodimethylaniline, and the other with concd. $CuSO_4$ soln.). The color of the shell tissues when seen by this light is buff or brown, the mucilage cells being almost colorless or a light yellowish green. The nib tissues appear in various shades of blue-violet. Treat 10 mg. of the powder with 10 cc. of EtOH-glycerol mixt. (equal parts of each), and allow to stand for 1 hr. Centrifuge, pour off the liquid layer, and add 1 cc. of borax-glycerol soln. (1 g. borax, 15 g. glycerol) to the solid residue. Mix thoroughly and place one drop upon a Hartwich-Wichmann counting cell. View through a microscope by means of ultraviolet light and count the number of shell particles visible over a given area. The percent of shells present can be ascertained by counting the shell particles in mounts of known compn.

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prepared in the same way and comparing with the count of the unknown. The samples employed for comparison must have about the same degree of fineness. A. F. S.

The preparation and taste of currant juice. J. D. DEWAAL. *Pharm. Weekblad* **52**, 882(1915).—An investigation was made of the taste and yield of currant juice obtained by 3 methods of prepn.: (1) The currants were crushed, pressed out cold, decanted, bottled, and sterilized for 1 hr. (2) They were crushed, steamed for 1 hr. in a closed vessel, and then pressed out, bottled and sterilized as in (1). (3) They were crushed, boiled up in their own juice for a short time, made up to the initial wt. with water and treated as in (2). In every case the taste of the product obtained by (1) was the best, but the yield was lowest. The taste of the products from (2) and (3) was the same; its inferiority to (1) is due perhaps to certain substances extd. from the stems. The yield from (2) was slightly the greater. The taste appears to be best in cases where the ratio invert sugar/acidity is greatest. P. VAN DER MEULEN.

"Stockfisch," "Klippfisch" and "Salzfisch." P. BUTTENBERG AND L. V. NOEL. Hamburg. *Z. Nahr.-Genussm.* **30**, 1–15(1915).—All 3 varieties are prepd. indiscriminately from various species of the genus *Gadus*, cod being frequently used, and occasionally also the variety *Brosmius brosme*. In prepg. "Stockfisch" the heads and viscera are removed, the remainder of the fish being dried in the open air without further treatment. A second form of "Stockfisch" is split longitudinally to within a short distance of the tail before drying. "Klippfisch" have the heads and viscera removed and are then slit open on the under side, spread out, and either dry salted or immersed in brine for 3 weeks. The salted fish are then dried by spreading upon racks in the open air. "Salzfisch" receive the same treatment as "Klippfisch," except that they are not dried. Analyses of the 3 varieties showed that the meat of "Stockfisch" contained the least moisture (about 14%), "Klippfisch" containing about 38%, and "Salzfisch" 59%. After soaking, the moisture content of all 3 became about the same as that of fresh fish. Results of 29 analyses are given showing the NH_3, moisture, protein, fat, ash, and NaCl content of the 3 varieties. During the soaking and washing of the fish an av. of 13.1, 11.99 and 13.34% for "Stockfisch," "Klippfisch" and "Salzfisch," resp., of the original protein content was lost in the wash water. The av. amt. of NaCl-free mineral matter lost in this way was 2.08, 0.91 and 0.91% (calcd. upon the wt. of original fish) for "Stockfisch," "Klippfisch" and "Salzfisch," resp.

A. F. SEEKER.

Recovery of amyl alcohol in acid-butyrometric determinations. H. KREIS. Basel. *Schweiz. Apoth. Ztg.* **53**, 402–3(1915).—Distil with steam the contents of about 100 butyrometer tubes, until about 250 cc. have passed; this amt. contains about 65 cc. amyl alc. contaminated with esters. Det. in 5 g. of substance the amt. of NaOH required to saponify the esters, add twice this amt. of powdered NaOH to the bulk and boil for 1 hr. using a reflux condenser. Add 1/4 the vol. of hot H_2O, shake cautiously, sep. the alk. liquid and fractionate the alcoholic layer. Reserve fractions below 125° for a later recovery, and distil the rest for amyl alc. at not over 132°. S. WALDBOTT.

Quick method for separating butter fat from non-fats. ST. KORPÁCZY. *Z. Nahr.-Genussm.* **30**, 24(1915).—K. finds plaster of Paris very efficient for this purpose, yielding a clear dry fat. Mix 40 g. butter with 10 g. finely powdered plaster of Paris by kneading with a spoon in a small dish. Allow to stand for 10 min., melt the fat in a water oven and filter through dry paper. A. F. SEEKER.

The judging of milk. K. AMBERGER. Erlangen. *Z. Nahr.-Genussm.* **30**, 16–23 (1915).—The histories of 2 cases are given together with complete analyses at different periods, showing that conclusions based upon the analyses of the milk in question as compared to the usual standards were completely erroneous. In the first case, the milk of a certain cow was found to be extremely variable, frequently showing a very

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low fat content, low fat-free solids, low lactose, and low refraction of the $CaCl_2$ serum, the minimum in those detns. being, resp., 1.0, 4.78, 0.85 and 22.8%. In addition the relation of protein to lactose was entirely abnormal and the sample sometimes gave a strong nitrate reaction besides having a pronounced salty taste. When mixed with the milk of another cow the product appeared to present conclusive analytical evidence of having been watered or of having come from diseased animals. Careful investigation showed that the cow in question was entirely sound and healthy, the abnormal milk having been caused by a prolonged period of irregular milking. The nitrate reaction was caused by straining the milk through a cloth which had previously been washed in well water with a high nitrate content. In the second case, the mixed milk of 2 cows showed the following results: sp. gr. 1.0265, fat 3.9, solids not fat 7.66, protein 2.59, lactose 4.05, ash 0.77, and refraction 37.0. Investigation showed that this milk had not been watered but was the genuine secretion of 2 underfed cows. Samples taken later when the animals were in a good state of nutrition gave normal analytical results. A. F. SEEKER.

The Neusal butyrometric method. E. REGGIANI. *Mod. zooiatro, parte sci.* No. 1, 9–21(1914); *Exp. Sta. Rec.* 32, 413.—A study of the method with normal, sterilized, boiled, watered, and skim milk, and milk preserved with H_2O_2, lime water, salicylic acid, $K_2Cr_2O_7$, CH_2O, boric acid, and $NaHCO_3$. As a rule the results obtained were slightly higher than those given with the usual acid butyrometric method, with the exception of the milk preserved with CH_2O and the milk boiled for 10 min. where the results are lower. E. J. C.

Formation of mucus in cream. KR. STÖREN. Aas, Norway. *Centr. Bakt. Parasitenk, II Abt.* 43, 323–6(1915).—It was noted that in certain samples of milk after standing for a while the cream became slimy but not the milk beneath it. On bacteriological investigation a bacillus was isolated that could produce acid and digest casein. This seems to be a new species of bacteria and is named *B. lactis acido-proteolyticum.* JULIAN H. LEWIS.

Determination of fat in ice cream by the Babcock method. C. A. A. UTT. *J. Ind. Eng. Chem.* 7, 773(1915).—U. has developed a modification of the Babcock method using a mixt. of H_2SO_4 and AcOH. The results on com. samples were good and those on samples of known comp. were in agreement to within 0.04–0.15% of the amt. of fat actually present. ISADOR MILLER.

A device for the successive determination of the solids and fat in milk and other fluids. A. SEIDENBERG. *J. Ind. Eng. Chem.* 7, 769–73(1915).—S. proposes the use of an oxidized Cu wire mesh to obtain distribution of solids and large surface for extn. ISADOR MILLER.

Ash determination in white bread. J. D. FILLIPO AND W. ADRIANI. *Chem. Weekblad* 12, 570–6(1915).—To avoid the usual errors in ash and Cl detn. in white bread, due to volatilization of NaCl and conversion of the latter to Na_2CO_3, it is recommended that the sample be treated with H_2SO_4, ignited, the ash moistened with 2 drops H_2SO_4 and a little $(NH_4)_2CO_3$, and then finally ignited at a red heat and weighed. This is called the "corrected sulfate ash." This c. s. a. × 8/9 = ash. The factor is based on a number of detns. of ash in white bread, and takes into account the ash from the yeast. For the detn. of NaCl in bread, 10 g. of the sample are treated with 2 g. CaO in a Pt dish, thoroughly stirred, ignited, and the Cl detd. by Volhard's method. To avoid corrections due to varying amounts of ash from milk, the results given are based on bread baked with water. By subtraction from the total ash the Na_2SO_4 corresponding to the NaCl, the wt. of the ash from the flour is obtained.

P. V. D. MEULEN.

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Determination of ash in bread. K. SCHERINGA. *Chem. Weekblad* 12, 702–3 (1915).—Boil 5 g. dry powdered bread with 45 cc. H_2O, add 50 cc. strong alc. and cool. Make up to 100 cc. with H_2O, filter and titrate 50 cc. according to Mohr. By this method 2.0% Cl was found as against 1.8% when the sample was ashed down with CaO. The loss of Cl in the second method is probably due to volatilization of the NaCl. S. criticizes the method of Fillipo and Adriani (preceding abstract), which does not establish a correction factor for the Cl present in the flour from which the bread is made. All flour contains Cl which is volatilized on ashing. P. J. DONK.

Determination of chlorine in feeds containing salt. J. D. FILLIPO AND W. ADRIANI. *Chem. Weekblad* 12, 703–6(1915).—Analyses of mixts. of flour and NaCl by ashing down with CaO give lower results than when similar samples are ashed with Na_2CO_3. The Na_2CO_3 method gives the better results. The loss of Cl on CaO ignition can be attributed to: (1) volatilization of the NaCl and (2) the decompn. of the NaCl by the charring organic matter. A large excess of Na_2CO_3 is essential. Methods for the detn. of NaCl without ashing are in progress. P. J. DONK.

Microscopic analysis of flour and bread. GUISEPPI TESTONI. *Stas. sper. agar. ital.* 48, 143–50(1915).—The cellulose tissue prepd. by treatment with 2 cc. concd. HCl per 100 cc. H_2O, then with 20% H_2O_2 and dil. alkali is so injured as to become unrecognizable under the microscope. A mixt. of 75 parts CCl_4 and 25 parts toluene has a density less than that of starch granules and greater than that of cellulose, namely 1.425 at 15°. If flour be shaken in a separatory funnel with this mixt. the cellulose rizes to the surface while the starch settles at the bottom. After the residue is drawn off, and the cellulose particles are washed with ether, they may be examd. according to usual methods. As the starch particles in bread have been destroyed by baking, the examn. of the cellulose is the best means of detg. the character of the product. The dry bread is ground in a mortar with glass or quartz and treated with the above mixt. in the same manner as described. J. A. LECLERC.

Note on the determination of sulfates in bread. C. D. HOWARD. *J. Ind. Eng. Chem.* 7, 807(1915).—Twenty-five g. air-dry, ground bread are digested for 2–4 hrs. on the H_2O bath with 200 cc. HCl (5%) with stirring at intervals. After cooling, decant the clear ext. through a folded filter, wash the residue 2–3 times with warm H_2O and ppt. sulfates in the filtrate with $BaCl_2$ as usual. ISADOR MILLER.

Baking qualities of flours from grades of wheat from Canadian western provinces. R. HARCOURT. *J. Soc. Chem. Ind.* 34, 821–2(1915).—The results of baking tests on flour produced in an exptl. mill from wheats during a period of four years are discussed. A table presents data on wet gluten, absorption, volume and weight of loaf and the color, texture and appearance of the bread from representative wheats of the different grades of wheat. H. A. PIPER.

Commercial valuation of flour. BENJAMIN R. JACOBS. *Bakers Helper* 29, 955 (1915).—A table is given showing the relative com. value of flours based on the following factors: moisture, ash, gluten, quality, acidity, color, loaves per barrel, fermentation, loaf volume, loaf color, loaf texture, and fermentation period. The av. of the fermentation value and the loaf value is used as one factor as it was found difficult to obtain uniform results from either one of these detns. alone so that in reality only ten factors of 100 points each are used. A high grade "patent" flour is given a value of 1,000 points and a "clear" flour a value of 700 points. The system is based on the relative values of $5.00 per bbl. for "patent" and $3.50 per bbl. for "clear" flour. The method has been used by the author on 400 samples of flour, the commercial values agreeing very closely with the relative commercial values of the flour, as submitted by the mill. H. A. PIPER.

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Report on bread wrapping. SAMUEL P. SADTLER. *Proc. Nat. Assoc. Master Bakers* 16, 161–93(1915).—A chem. and bact. examn. was made of both wrapped and unwrapped bread and also of various types of paper to det. the kind of paper which is best adapted for the sanitary purpose and yet keeps as much as possible of the natural elements of the loaf intact. S. concludes that the wrapping of bread in waxed or paraffined paper is unsatisfactory due to the holding of moisture on the surface of the bread and the lack of ventilation. It was found that the wrapping of bread in porous paper that will allow a gradual loss of moisture and of ventilation is usually satisfactory. In the case of Vienna and rye bread, wrapping impairs the crispness and flavor of the crust and in the latter it hastens souring. H. A. PIPER.

Potato determination in war-bread. W. HERTER. Steglitz. *Chem. Ztg.*, 39, 555–6(1915).—A microscopic method for counting the grains of starch. Cf. *C. A.* 9, 2112. J. H. MOORE.

Better bread by means of natural lactic acid. A. WAHL. *J. Ind. Eng. Chem.* 7, 773–5(1915).—Preliminary paper on the improvement of bread as influenced by the presence of lactic acid produced by *Bacillus delbruecki*. The general conclusions drawn from the investigation are stated. It may be said that lactic acid improves the qualities of the bread. This is true of the acid in any form but is most pronounced in the case of acid occurring as a result of bacterial activity.
ISADOR MILLER.

Banana meal from Jamaica. ANON. *Bull. Imp. Inst.* 13, 200–1(1915).—An analysis of banana meal showed a food value of 93 cal. as compared with 117 cal. for wheat flour. The banana meal contained but 4.6% proteins while the wheat flour contains 13.6%, so it cannot compare in food value with etiher wheat flour or maize meal. The sample examd. contained but 2.3% true proteins and an equal amt. of other nitrogenous substances; these latter (probably amides) may be due to the degree of maturity of the fruits from which the meal was prepd. R. L. SIBLEY.

The digestibility of the proteins of several cereal and leguminous flours and desiccated potatoes, and their value for the nutrition of the (German) people and troops during the war. O. RAMMSTEDT. *Pharm. Zentralhalle* 56, 1–7, 14–7, 22–5(1915).—The digestibility of the proteins of corn, wheat, rye, buckwheat, oats, lentils and peas was found by detg. the N before and after digestion of the material with pepsin in very dil. HCl soln. and calcg. the protein digested by difference. *Conclusions:* As substitutes for meat the foods mentioned have a limited value. Potatoes contain too little protein and too much water. The leguminous flours and corn meal, especially the latter, possess the greatest value. C. O. EWING.

Prickly pear feeding experiments. E. W. HORN. Dept. of Agr., Bombay, *Bull.* 58(1914); *Bull. Agr. Intelligence* 6, 442–3.—The compn. of prickly pear fodder prepd. by burning off the spines and then cutting the slabs into small pieces was found to be as follows, the first figure being for a dry and the second for a wet season: moisture, 79.32, 92.75; ether ext., 0.78, 0.22; albuminoids, 0.68, 0.31; carbohydrates, 11.61, 4.37; fiber, 2.48, 0.85; ash, 5.13, 1.60%. It was successfully fed to cattle.
E. J. C.

The feed value of brewed hops, dregs and yeast. W. VÖLTZ, N. MUHR, A. BAUMANN AND W. DRAUZBURG. *Landw. Jahrb.* 47, 639–71(1914).—Brewed hops have about the same feed value as hay of av. quality but the digestible protein content is somewhat higher. Their physiological value is 30% of the energy content. The feed value of dregs is 40% of their energy content. Although the protein is digested more poorly by hogs than by cattle, the N-free substances are digested somewhat better by them. C. F. MILLER.

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Beans from Burma. ANON. *Bull. Imp. Inst.* 13, 196–200(1915).—Two crops of beans raised from the original seed beans showed a progressive increase in the amt. of HCN yielded. The original seed yielded 0.0025% acid while the second crop gave 0.008%. It is believed that in some way the season was favorable to the production of cyanogenetic glucosides. A chem. analysis of two of the seven samples of beans reported is included. R. L. SIBLEY.

Beans of Canavalia spp. from Montserrat and India. ANON. *Bull. Imp. Inst.* 13, 192–6(1915).—Analysis showed 26.09 proteins, 3.90 fats, 46.91 starch, 2.8% ash, and gave 121.9 food units. In chem. compn. these horse beans are very similar to *C. ensiformis*. Their toxicity is still an unsettled question, but it is believed that they can be used as food for cattle. R. L. SIBLEY.

Action of lactic acid bacteria on proteins (silage) (STUTZER) 11C. The yoghurt bacillus (DUCHACEK) 11C. Determination of volatile oils in citrus oils and extracts (ALBRIGHT) 17. Coagulation of milk (MILROY) 11A. Estimation of nitrogenous constituents of meat extracts, etc. 11A. Manufacture of cream of tartar (BEST) 16.

CARLES, P.: **Les conserves de tomates.** Bordeaux: Feret.

LEFFMAN, H.: **Analysis of Milk and Milk Products.** 4th ed. Philadelphia: Blakiston. $1.25.

MICKO, K.: **Ueber Bouillonwürfel, Speisewürzen und Fleischextrakt.** 2 Mitteilg. Berlin: J. Springer.

MORSE, I. H.: **Calculations Used in Cane-Sugar Factories.** New York: Wiley. 75 pp. $1.50.

Brit., 11,711, May 12, 1914. J. S. REMINGTON. A **food for animals** consists of malt ext., cod-liver oil, sharps, and gelatin dissolved in H_2O, with smaller proportions of fenugreek, gentian, and ginger, having flavoring or tonic properties. Non-diastatic malt ext. is used if the food is not required for immediate consumption. The gelatin is dissolved in H_2O and mixed with the other ingredients at 130–150° F. The product is passed through a cubing machine, dried, and wrapped in grease-proof paper. As an alternative, the dissolved gelatin may be first mixed with the liquid ingredients, and the dry ingredients afterwards added; the mixt. is allowed to cool and is again thoroughly mixed, after which it is forced into molds to produce cakes or cubes.

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14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

The theory of slow sand filtration. K. KISSKALT. *Z. Hyg.* 80, 57–64(1915).—Samples of H_2O taken at different levels of a sand filter show the presence of a large number of protozoa. One part of KCN in 1000 parts of H_2O will kill the protozoa but will not kill the bacteria. When H_2O treated in this way is run through a sand filter it is not so nearly freed of bacteria. The author believes from this expt. that sand filters purify H_2O by biological processes through the agency of the protozoa, rather than by physical means. JULIAN H. LEWIS.

The purification of water with ozone. FRANZ SCHÜTZ. Univ. Königsberg. *Z. Hyg.* 79, 359–435(1915).—An extensive study was made on the purification of H_2O from the river Pregel with ozone and alum. With the use of these two substances a clear, colorless drinking H_2O, which has no taste and few bacteria (not pathogenic),

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is obtained. Ozone alone reduces the number of bacteria, but the resulting H_2O is not clear. JULIAN H. LEWIS.

Purification of drinking water with hypochlorites. J. D. RUYS. Delft. *Z. Hyg.* 79, 511–20(1915).—Hypochlorites should be added in slight excess, detd. for each sample of H_2O. The amt. needed depends on the quality of the H_2O, the degree of purity desired, and the length of time that can be devoted to purification. J. H. LEWIS.

The testing and rapid sterilization of water for troops in the field. VERGNOUX. *Union pharmaceutique*, May 15, 1915; *Répert. pharm.* 27, 174–6(1915).—V. recommends the Griess method for detg. HNO_2 and Nessler's for NH_3. In the field the estn. of Cl is useful but not indispensable. To sterilize the H_2O use 2 solns., (1) a satd. soln. of $Na_2S_2O_3$ in boiling H_2O; (2) a soln. of 1 g. I, 0.05 g. KI, 1 g. H_2O and 8 g. EtOH (95%). To det. the amt. of the I soln. necessary, add 100 cc. of the H_2O to be tested to each of 10 125 cc. flasks, inoculate each with a drop of fresh culture of *B. coli* or Eberth's bacillus and add in succession 1,2–9,10 drops of the I soln. After 30 min. decolor the liquids with a drop of the $Na_2S_2O_3$, transfer each to a 250 cc. flask containing 100 cc. of sterile bouillon and warm to 37°. Examine the flasks at the end of 24 hrs. The first flask remaining limpid has the minimum amt. of I necessary for sterilization. In general 5 drops (0.01 g. I) per l. are sufficient. H. L. OLIN.

Ultraviolet rays from the oscillating spark. J. KOWALSKI. *Elec. Rev. West. Elec.* 66, 1055–6(1915); cf. *C. A.* 8, 3534.—The oscillating spark was found to be a more economical source than the quartz-enclosed Hg vapor. H_2O sterilization requires but 45–90 w. hrs. per 1000 gal. To increase the amplitude, the capacity of the oscillating circuit must be as great and the inductance as small as possible. Electrode material and frequency of sparking det. the ultraviolet radiation. The intensity from a 22 mm. gap between invar electrodes is proportional to *2*, *1.6*, *1.3*, and *1.0* with 20, 30, 40 and 50 sparks per sec. The percentage distribution of radiation horizontally in the direction of the axis of a 110 v. Heraeus lamp at 90 v., 3.1 amp. was: heat 24%, visible rays 41%, ultraviolet rays 35%. From 22 mm. gap between invar electrodes at 30 sparks per sec. with 50.5 amp. in oscillating circuit: heat 22%, visible rays 18.6, ultraviolet 59.4%. Oscillating spark shows 70% greater ultraviolet radiation. For H_2O sterilization the spark may be produced directly in H_2O without quartz envelope, which means an additional saving. W. H. BOYNTON.

The use of drinking water containing much magnesium chloride and magnesium sulfate; its influence upon health. C. L. REIMER. *Gesundh. Ing.* 38, 227–8(1915).—Such waters are often found where potash liquors are discharged. The Imperial Board of Health allows 110 p. p. m. of $MgCl_2$ as the max. However, waters with a much higher salt content can be used with impunity. Tjaden found the Weser River water unsuited for drinking purposes when its $MgCl_2$ content rose to 168 p. p. m. Mortality statistics seem to bear out the conclusion that waters containing an excessive quantity of Mg salts are not detrimental to health. ARTHUR LEDERER.

Standard method of determining nitrate reduction. R. S. BREED. *Science* 41, 661(1915).—B. criticizes the method of the committee on standard methods of bacterial water analysis and shows that no one broth can be used for all organisms, and that suitable broths must be devized to fit each group; otherwise an organism may be reported as lacking power to reduce nitrates when it fails to reduce them in a broth in which it does not grow. L. W. RIGGS.

Stream gaging by titration: Comparative tests of new chemical and standard mechanical methods of gaging stream flow. L. W. COLLETT, *et al.* *Eng. Contrg.* 42, 270–3(1914); *Expt. Sta. Record* 32, 685.—This article explains the method of stream gaging by chem. means, describes the prepn. of the soln., and the computation of re-

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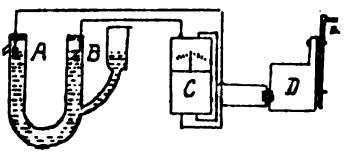
sults. The process is based on the theory that if a const. quantity of concd. soln. of NaCl be injected into a stream and samples of water taken at a certain distance from the point of injection into the stream, the discharge may be detd. by the fact that the ratio of the discharge of the initial soln. to the discharge of the final soln. is inversely proportional to the ratio of their concn. The conditions necessary for the success of this method of gaging are (1) a const. rate of flow of the initial soln., (2) perfect mixing, and (3) accurate titration of the salt soln. Comparative tests made in Switzerland of the chem. method with the current meter, curtain, and weir methods are described, from which it is concluded that the titration method is rapid and exact. E. J. C.

The saline method of water flow measurement. W. D. PEASLEE. *J. Elec. Power and Gas* **35**, 130–135, 148(1915).—A description of a method for water-flow measurement that fills the requirements of the practicing engineer as to simplicity and accuracy. A brief review of the theory is given, followed by directions for dosing, mixing and analysis. The use of ordinary rock salt is recommended on account of low cost, as this introduces an error of less than 0.1%. The cond. method for the detn. of the salt in soln. was also investigated and found to be very useful and accurate. A compact and portable set is described (see fig.). *a* and *b* are Pt electrodes, *c* is a cond. meter, and *d* is a hand-driven motor. A calibration curve and a curve of temp. correction factors are given. W. E. RUDER.



Auto-purification of water. FLAMAND. *Bull. soc. chim. belg.* **28**, 9–10(1914).—F. discusses some results obtained with the new system of auto-purification of H_2O in which the Blondiau filter brick is employed. This brick is made of baked clay and contains 16 draining channels; 8 of these channels are open at 1 end of the brick (toward the H_2O-bearing sand), while the remaining 8 are open at the other end (at the wall of the well). The bricks are constructed so that the filtering surface is proportional to their length, *i. e.*, to the thickness of the wall (inasmuch as the bricks are so placed that the area of the wall of the well is equal to the sum of the cross sections of the bricks). The usual dimensions of the bricks are 10 × 10 cm. cross section and 22 cm. length; only 5–6 bricks are required to provide 1 sq. m. of filtering surface, while 93 bricks are necessary to furnish a wall area of 1 sq. m. One sq. m. of wall surface is capable of filtering 9300 l. of H_2O daily under a pressure which is equivalent to a head of 4–5 m. of sand and H_2O; this is equivalent to 100 l. per brick. The principle of the action of these filter bricks is that of capillarity and they are so constructed as to present a large area of porous surface. Water with a high content of organic matter, NH_3 and nitrites, and a pronounced odor of H_2S was filtered through 4 m. of sand which rested upon a base composed of Blondiau filter bricks; the organic material was entirely removed by this filtration and the H_2O was inodorous and no longer gave tests for NH_3 and nitrites. H. S. PAINE.

Potash liquors and water supply. TJADEN. *Gesundh. Ing.* **38**, 280–6(1915).—It is desirable to retain the fixed standard of the German Imperial Board of Health, which allows a max. of 110 p. p. m. of $MgCl_2$ in waters. ARTHUR LEDERER.

Whipping chemicals into a colloidal water increases efficiency. BLACK AND VRATCH. *Eng. Record* **72**, 292–3(1915).—It was found at Burlington, Kans., that whipping the chemicals into the water materially reduces the amt. necessary to obtain a satisfactory flocculation. Expts. on the colloidal Neosho River water showed that no advantage could be found in using potash alum instead of $Al(SO_4)_3$. Lime and $FeSO_4$ treatment was not economically practicable. It was found possible to use lime to prepare the water for treatment with alum, thereby reducing the total chemical cost.

FRANK BACHMANN.

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State supervision of public water-supplies in Kansas. F. R. HESSER. *Eng. News* 74, 546(1915).—H. quotes the new state law, and describes office details and methods. Annual inspections are made of sewage and water plants, with a charge varying from $12.50 to $150 per year to the plant. LANGDON PEARSE.

A water-borne typhoid fever epidemic at Healdsburg, Calif. *Eng. Contrg.* 44, 179–80(1915).—Between July 15 and Sept. 22, 1914, 90 cases and 7 deaths occurred from typhoid in a town of 2100. The city water was found polluted even though taken through 120 ft. of gravel. The use of $CaOCl_2$ stopped the epidemic. L. PEARSE.

Water Works Dept. W. H. DURBIN. *Annual Rept. Evansville, Ind.* 1914, 123–63. —An av. turbidity of 180 pts. per mil. was eliminated. Bacteria were reduced from 1312 to 29 on agar, and 5042 to 45 on gelatin. The positive tests for *B. coli* were reduced from 82% in 1 cc. samples of the raw water to 7.5% in the filtered water. 2.1 grains of $FeSO_4$, 1.14 grains of $Ca(OH)_2$, and 0.27 grain per gal. of available Cl in bleaching powder were used with a cost of $2.48 per mil. gals. E. BARTOW.

Water purification. JOHN L. PORTER. *30th Semi-Annual Rept. of The Sewerage and Water Board, New Orleans* 1914, 95–110; cf. *C. A.* 8, 3831.—By the purification a turbidity varying from 60 to 2400 pts. per mil. was entirely eliminated. Bacteria were reduced from 1900 to 19, using an average of 4.97 grains per gal. of lime and 0.31 grain per gal. of $FeSO_4$. E. BARTOW.

Small waterworks revamped under service. G. W. KNIGHT AND R. F. MACDOWELL. *Eng. Record* 72, 287–8(1915).—Rapid sand filters and a new pumping station have been constructed at Painesville, Ohio, to replace lake shore infiltration galleries. The improvement was made without interference with the old service. FRANK BACHMANN.

Marysville filters handle excessively turbid water. C. C. YOUNG. *Eng. Record* 72, 290–1(1915).—The turbidity of the raw water was 75,000 and alkalinity 40 p. p. m. A total dose of 8 grains of $Al_2(SO_4)_3$ per gal. was divided 5 grains at the raw water inlet and 3 grains at the outlet of the settling basin. Settling period of 6.3 hrs. was used. The filtered water was clear and always contained some alkalinity. FRANK BACHMANN.

Rotary screens remove macroörganisms from Denver's lake water supply. D. G. THOMAS. *Eng. Record* 72, 291–2(1915).—A 40-mesh screen was built to screen 20 mil. gal. water daily, removing the larger forms of algae and "moss," mostly *Chara*. It was found that a 100-mesh screen will retain *Cyclops*. A sterilization plant is located beyond the screens. FRANK BACHMANN.

Air-bound filters the chief difficulty in operating Wilmington's water purification plant. EDGAR M. HOOPES, JR. *Eng. Record* 72, 282–4(1915); cf. *C. A.* 8, 2913.—Liberation of air in filter beds due to negative head gave great difficulty in operation. Dynamite was used to break ice on beds in winter so that the sand washing machine could operate. FRANK BACHMANN.

Some design features of the Montebello water filters. J. W. ARMSTRONG. *Eng. Contrg.* 44, 198–9(1915).—These filters are part of the Baltimore supply. The capacity is 128 mil. gal. daily. Lime and iron are used as coagulants. A mixing basin (31-min. period), coagulating basins (3-hr. period), filtered water reservoir (17.5 mil. gal. capacity), and 32 filter units complete the plant. LANGDON PEARSE.

St. Louis Water Works improvements. *Munic. J.* 39, 360(1915). L. P.

Water purification at Augusta, Ga. *Munic. J.* 39, 364(1915).—In treatment of water supply the av. charge of $Al_2(SO_4)_3$ was 0.68 grain per gal. for year 1914, with a max. month of 1.4 and a min. of 0.16. LANGDON PEARSE.

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Improvements to water supply at Port Hope, Ont. *Can. Engr.* **29**, 317–21(1915).—Water taken from Lake Ontario at a depth of 10 ft. is treated on covered, slow sand filters (0.2 acre in area) having 3.5 ft. of sand. LANGDON PEARSE.

Chlorine control apparatus for water and sewage purification. *Can. Engr.* **29**, 276–8(1915).—Existing app. is described for applying liquid Cl, covering manual and automatic types. For small amts. a soln. in H_2O is used. LANGDON PEARSE.

Analytical methods for the control of sewage treatment works. COMMITTEE OF AMERICAN PUBLIC HEALTH ASSOC., 1914. *Am. J. Public Health* **5**, 935–43(1915); *Eng. Contrg.* **43**, 3(1915); *Eng. News* **73**, 64–5(1915); *Surveyor* **47**, 4–7(1915).—A schedule of tests is presented, listed for different types of plants, based on Standard Methods, A. P. H. Assn. Analytical supervision is advised, with careful records. Neatness of the plant is essential. Frequent sampling is recommended. The detn. of suspended matter (Gooch crucible method), nitrates, dissolved O and relative stability are advised for effluents, with presumptive tests for *B. coli* where a water supply is entered. The avidity for O should be tested. In sludge should be detd. sp. gr., % moisture, % dry residue, volatile matter and reaction. In crude sewage Cl may also be detd. L. PEARSE.

Investigations on the nature and elimination of odors and dust from a garbage reduction plant. H. W. MAHR AND A. C. KRAFT. *J. Ind. Eng. Chem.* **7**, 778–85 (1915).—The investigation was carried out at the New York garbage reduction works. The substances carried over mechanically to the condensers are principally mineral matter, fats and fatty acids. The volatile substances in the vent gases which may be condensed or absorbed in H_2O are alc., AcOH, CO_2, essential oils and S compds. The uncondensable vent gases consist of CO_2, O and large amts. of S compds. The H_2O from the condensers could be deodorized by Na and Ca hypochlorite, the same being true of the uncondensable gases if they first were scrubbed in H_2O. Heat treatment at high temp. is insufficient by itself for this purpose because large amts. of SO_2 are formed, but if this SO_2 is absorbed in H_2O the gases are deodorized completely. At the present time scrubbers eliminate practically all the dust in the dryer gases. All odors can be completely removed by H_2O and treatment with hypochlorite.

ISADOR MILLER.

Comparison of methods for determining putrescibility or oxygen-demand. F. E. HALE AND T. W. MELIA. *J. Ind. Eng. Chem.* **7**, 760–4(1915).—The methods examd. were: Dilution method of Jackson and Horton (*C. A.* **3**, 2844) using both distilled and tap H_2O, English excess oxygen dilution method (with modifications) and Lederer nitrate method using excess nitrate. The conclusion is drawn that at present the first is the only reliable method in use. The results of the other methods are in agreement with the results from this if rightly interpreted and corrected. ISADOR MILLER.

Algae growths cover Atlanta sewage filters. CHARLES C. HOMMON. *Eng. Record* **72**, 335(1915).—A heavy growth of blue-green algae was removed from the Peachtree Creek plant. The growth was allowed to dry and then raked off the beds. Cost of cleaning was $28.80 per acre. FRANK BACHMANN.

Pollution of streams. STATE BOARD OF HEALTH OF CONNECTICUT, 1914.—Analyses of all the waters in the rivers of the state were made under the direction of the State Board of Health. With few exceptions all the streams gave evidence of pollution. In the larger tidal streams the flow is so large and the vol. is so increased by the tide that dilution is sufficient to take care of sewage and wastes. The smaller, non-tidal streams do not have sufficient dilution of the water and purification is advized.

E. BARTOW.

Activated sludge progress at Cleveland, Ohio. R. W. PRATT. *Eng. News* **74**, 571(1915); cf. *C. A.* **9**, 1522.—A unit handling 1 million gallons of sewage is to be built.

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The exptl. tank gave good results with 3-hr. aeration and 10 to 15 min. sedimentation.
LANGDON PEARSE.

Method and cost of collecting and incinerating garbage at Racine. P. H. CONNOLLY. Wis. League of Municipalities, 1915. *Eng. Contrg.* 44, 211–2(1915).—In 1914, 2900 tons of garbage were collected at $2.42 per ton and burnt for $1.29 per ton.
LANGDON PEARSE.

The Emscher tanks of Erfurt (Germany). G. STRASSBURGER. *Gesundh. Ing.* 38, 229–39,245–51(1915).—The tanks operate successfully. Approx. 95% of the settleable solids are removed. Such tanks are not suited for sewages, which easily undergo acid fermentation. Foaming is one of the indications of this condition. Sewages containing considerable lime and mineral constituents undergo putrefaction quite readily.
ARTHUR LEDERER.

Researches with grotan, a new disinfectant. AUMANN AND STORP. *Berl. klin. Wochschr.* 51, 398–400(1914).—Grotan has no definite chem. formula. Analyses show: Cl 19.2, Na 7.8, and H_2O 14.0%. Weak aq. solns. are clear. When in concd. solns. there is liberated an oily substance which is solid when cooled. This substance is chlorocresol. In soln. or in solid form it has no corrosive action on the hands or instruments. It has a phenol odor and a red color, which properties provide a caution against its careless use. In a 0.33% soln. it shows a strong disinfectant action.
JULIAN H. LEWIS.

The influence of moisture in the air on mine ventilation. ARTHUR C. WHITTOME. *Iron Coal Trades Rev.* 91, 127–9(1915); *Colliery Guardian* 109, 269–70(1915).—Air should be cooled as much as possible before it enters the downcast shaft and should be dried to increase its density. The air in the entries and the upcast shaft should be satd. with H_2O to increase the draft intensity; this may be accomplished by spraying the walls. H_2O which had absorbed deleterious gases should not be used for spraying and CO_2 should be removed before it goes through the pumps to prevent corrosion.
H. L. OLIN.

Essentials of swimming pool sanitation. WALLACE A. MANHEIMER. *Public Health Reports* 30, 2796–2811(1915).—The quality of water in a swimming pool may be improved by increasing the cubical content of the pool, by adding dilg. water, by careful supervision of the bathers, but best by refiltration and disinfection of the water.
E. BARTOW.

DANIELS, F. E.: **The Operation of Sewage Disposal Plants.** New York: Municipal Journal. 136 pp. $1.50.

KERSHAW, G. B.: **Guide to the Reports, Evidence and Appendices of the Royal Commission on Sewage.** London: P. S. King. 178 pp. 5 s.

KOLB, A.: **Ueber Permutit, dessen Anwendung und die mit ihm gemachten Erfahrungen.** Berlin: A. Seydel.

STEIN, M. F.: **Water Purification Plants and their Operation.** New York: Wiley & Sons. 247 pp. $2.50.

WILHELMI, J.: **Kompendium der biologischen Beurteilung des Wassers.** Jena: G. Fischer. 66 ss. 3.20 M.

Brit., 11,799, May 13, 1914. H. HOCKING. An app. for **purifying feed water** and for sepg. oil from the H_2O comprizes a decanting chamber to which the liquid is admitted and uniformly distributed near the bottom, and from which the H_2O escapes over a submerged weir to the bottom of a filtering chamber.

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15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

Denitrification in agrarian soil and root-disease ("arrabbiaticcio"). C. LUMIA. Rome. *Ann. chim. applicata* 4, 1–56(1915).—When liquids were used in the expts. they were placed over Hg in inverted eudiometers and the gas that developed was collected at the top. When soil was used in large quantity as the medium of action, it was put into an Erlenmeyer flask and the gas developed was led over Hg in a eudiometer. In 100 cc. of the nutritive soln. used there was present 10 g. KNO_3 (or equiv. quantity of other nitrates) 7 g. citric acid, 2 g. $MgSO_4$, 2 g. K_2HPO_4, 0.2 g. $CaCl_2$, 0.05 g. $FeSO_4$, the whole made slightly alk. by careful addition of concd. NaOH. This soln. acted upon by soil with and without confined air, showed a production of 14.6–17.6 cc. N in the 1st case and 19.6 cc. in the 2nd. in about 9 days, although in presence of air the period of incubation was reduced. The effect of various fertilizers and other substances was tried. Thomas slag in liquid culture had no impeding action, but rather the process was hastened because of the greater alkalinity produced. The quantity of N was less than that given by the control tube in the same time. NH_4NO_3 varied slightly from the KNO_3 in the control tube; it was evident, however, that the N of the NH_4 group was also set free. $(NH_4)_2SO_4$ in the liquid in proportion of 2:1000 neither accelerated nor retarded the reduction of the nitrates. When NH_4Cl was substituted for KNO_3 in the control tube, no liberation of N took place, evidently because of the absence of O in the mol. $CaCN_2$ in the culture liquid retards denitrification when present in the proportion of 1, 1.5, 2, 2.5 parts per 1000. In contact with earth in the proportion of 1 and even of 0.5 per 1000, it retards the beginning of the process and renders the liberation of N slow and incomplete. This property is very valuable, because a retardation in the process of decompn. of nitrates may be of great utility, if, as often happens, there arizes one of the conditions (humidity, heat, etc.) that det. the rapid biochemical decompn. of the nitrates of the soil and of those nitrates which the farmer puts there in his nitric fertilizers. $CaCN_2$ also has a direct fertilizing action. KNO_3 brings about quicker denitrification when present in 1 part per 1000; 25 parts per 1000 give the longest period of incubation. Humous substances considerably increase the denitrifying process. With decrease of H_2O in the soil, the period of incubation increases. When the H_2O reaches 49% or more of the soils' hydrating capacity, denitrification proceeds the same as in satd. soils. The amt. of CO_2 that is set free increases with the decrease of H_2O in the soil, due probably to the greater amt. of air and therefore of O available to the bacteria as the H_2O content drops. When the H_2O is less than 8% of the dry earth and less than 15% of its hydrating capacity, denitrification does not take place. When the H_2O reaches 13.5% of the dry soil wt. and 27% of its hydrating capacity, denitrification takes place with $^1/_3$ of the intensity exerted by soil contg. 37% of its total capacity for H_2O. Reliable conclusions cannot be drawn, however, without exptg. with many samples of soils of different hydrating capacities. At temps. above 22°, denitrification takes place with considerable violence, while at lower temps. the process becomes slower and is attended with less and less violence. To have the largest amt. of denitrification possible, the following conditions must act together: presence of nitrates, absence of free and continuous circulation of air, a temp. not less than 22°, presence of H_2O not less than 18% of the dry soil wt. or than 35–37% of its hydrating capacity, presence of easily decomposable humous matter, of citrates, malates, etc., or of complex substances undergoing decaying action—legumins in the green being of 1st importance, then fresh and ripe cow dung, and straw of cereals. The undesirable condition of soil called "arrabbiaticcio" is due, according to L., neither to arrest of nitrification nor to excessive intensity of nitrification, but to a real denitrification in the soil. The absence of any one of the essential conditions above mentioned will prevent denitri-

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fication. To overcome the condition of "arrabbiaticcio," L. suggests these remedies: (1) Not to work the ground in summer just after a light rain. (2) Add organic fertilizers in autumn and always when the temp. of the soil (active layer) is below 20–22°. (3) Autumnal working of the soil is harmless; that done in spring, in temperate and warm regions, is harmful. (4) Remove carefully from the field weeds and their roots for garden mold. (5) Consider the special conditions of each crop, which, as in the case of rice, are exposed to the dangers of denitrification, and expt. with the applicability of $CaCN_2$ and NH_3 salts in contrast to nitric fertilizers. (6) Fertilizers used as covering with nitrates for cereals of autumn planting should be applied very quickly and when the temp. of the soil has not reached 20°. If they are applied slowly they should be mixed with an equal amt. of $CaCN_2$. (7) For fertilizing as covering for cereals of spring planting, especially if in irregular soils or soils not free of clay, manure or $CaCN_2$ or NH_4 salts should be preferred to nitric fertilizers, or these latter mixed with $CaCN_2$. S. Levy.

The soils of the Hawaiian Islands. W. R. Kelley, Wm. McGeorge and Alice R. Thompson. Hawaii Agr. Exp. Sta., *Bull.* 40, 35 pp.(1915).—The bulletin deals with general properties of Hawaiian soils among which are noted: origin and formation; physical properties, *e. g.*, mechanical classification and drainage conditions; chem. characteristics, including potash, phosphoric acid, nitrogen, peculiar soils, coral sand soils, lime-magnesia ratio, acidity of Hawaiian soils and ferrous iron; biological conditions, nitrification and ammonification; soil management, with reference to tillage, to injurious effect of puddling, to rotation of crops, erosion and drainage, and use of fertilizers. The chem. and mechanical compn. of a number of Hawaiian soils is given. B. E. B.

Chemical composition of alluvial soils of the Falcat River basin in Sahel Eritreo. A. Maugini. *Agricoltura coloniale* 9, 1(1915); through *Ann. chim. applicata* 4, 71–2 (1915).—M. drew the following conclusions from the study of 29 samples of soil: (1) The soils of the lower basin of the Falcat lie in level or slightly wavy strata, and present conditions of great uniformity, fine earth predominating in them. (2) They are of alluvial nature. Annually during flood periods the mire transported by the current is deposited on the mobile coastal sands, that are permeable to H_2O and air, giving rise to siliceous-clayey soils. (3) The physical structure of the greater number of the samples is favorable to cultivation. The permeability to H_2O varies as the sandy or clay particles predominate. The more compact soils allow H_2O to pass through only with great difficulty, and become split up during the dry season, forming masses in which capillary actions assume remarkable intensity. (4) On account of the continual deposition of slime all the soils of these regions contain large amts. of organic substances and of N, except the sands, which, however, are not widely spread. The Falcat soils are deficient in $CaCO_3$. (5) The deficiency of $CaCO_3$ and the presence of large quantities of sol. salts would presumably exercize an unfavorable influence on the activity of microbic flora. Organic changes that depend on the action of microorganisms must necessarily be slow or absent, so that, the formation of NH_3 and HNO_3 being hindered, the organic material in the soil probably remains in an inert condition, useless for plant growth. The amts. of NaCl varied very much in the individual samples, and attained high values in some. S. Levy.

The gases of swamp rice soils. II. Their utilization for the aeration of the roots of the crop. W. H. Harrison and P. A. Aiyer. *Memoirs, Dept. Agr. India,* Chem. Ser. 4, No. 1, 1–17(1914).—A continuation of Part I (cf. *C. A.* 8, 772). Known vols. of mixtures of the soil gases (CH_4, H, CO_2, N) and O were sealed up in glass vessels with a mixt. of the surface film from the soil and sterile mineral nutrient soln. After standing for 8 hrs., the residual gas was measured and analyzed. In the presence

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of sunlight the vols. of CH_4, H and CO_2 decreased while that of O increased correspondingly. In the dark the vols. of CH_4 and O decreased while that of CO_2 increased. These expts. show that the action of the film is 2-fold: (1) it oxidizes CH_4 and H to CO_2 and H_2O, resp.; (2) it decomposes CO_2 to O. The first effect is said to be due to the action of bacteria, the second to that of the green algae, diatoms, etc. The authors further conclude that there is present a third agency, by means of which CO_2 is assimilated without the liberation of O. Further expts. show the absorption of CO_2 and corresponding liberation of O in the light and the complete absorption of H in the dark as as well as in the light. Crude cultures of the bacteria oxidizing CH_4 and H, resp., were obtained by repeated transfers to sterile mineral nutrient soln. Photomicrographs of the organisms in plates are shown. Pure cultures were not obtained and the assertion is made that different species of bacteria act together. From a study of the vols. of the gases absorbed and liberated in the oxidation of CH_4 by the above culture, it is further concluded that CH_4 is also assimilated directly. The film is regarded as a concentrator of O with an effect such that the maximum concn. is produced in the water entering the soil. This in turn leads to correspondingly increased root aeration. The function of green manuring is to increase the output of soil gases, thereby increasing the production of O and the root aeration. The effect of drainage is discussed.

H. W. D.

The reactions between dilute acid solvents and soil phosphates. J. A. PRESCOTT. *Proc. Chem. Soc.* 30, 137–8(1914); cf. *C. A.* 8, 2588.—The action of dil. acid solvents on soil with respect to the amt. of P_2O_5 extd. was investigated. The extns. were made at const. temp. for varying lengths of time and with initial concns. of from 0.06 to 0.2 equivalents of acid per l. The amt. of P_2O_5 extd. is approx. proportional to the initial strength of the extg. acid. With HNO_3, HCl and H_2SO_4, an increase in the time of extn. brings about a decrease in the amt. of P_2O_5 extd. With citric acid the reverse is true. The amt. of acid neutralized by the soil increases with the time of extn. but an excess of acid always remains, large in proportion to the amt. of P_2O_5 present. The greatest diminution in the quantity of phosphate extd. with increase in time of extn. occurs with soils containing the highest proportion of clay. In view of the large excess of acid present it is difficult to account for the removal of the P_2O_5 from the soln. on chem. grounds and it was decided that the phenomenon is one of adsorption. The Freundlich law was found to hold in the several cases tried. R. L. SIBLEY.

The antagonism between ions in the absorption of salts by plants. W. STILES AND I. JÖRGENSEN. *New Phytologist* 13, 253–68(1914); *Bull. Agr. Intelligence* 6, 402–3(1915).—From a brief review of the work published on antagonism it is shown that this is a phenomenon of universal occurrence in organic life. J. J. S.

Influence of organic substances on the transposition and action of nitrogen compounds in soil. GERLACH. *Mitt. Kaiser Wilhelms Inst. Landw. Bromberg* 6, 309–27 (1915); *Chem. Zentr.* 1915, I, 1385.—A progress report on field expts. with various salts and organic substances. W. H. FRY.

Storing calcium cyanamide. A. H. BURGESS AND D. R. EDWARDS-KER. *J. S. E. Agr. Coll. Wye, Kent* 22, 363–7(1915).—To det. the changes in N content of $CaCN_2$, samples were stored under varying conditions. In open air N loss was 0.057% per day and wt. increased; in moist CO_2-free air no N was lost and wt. increased; in dry air with CO_2 no N lost and little increase in wt.; in moist air with CO_2 no N lost but wt. increased. To prevent loss of N, paper bags should be used in shipping and the material worked into the soil quickly. R. O. E. D.

Experimental smoke injuries. H. WISLICENUS. *Samml. Abhandl. Abgase u. Rauchschäden* 10, 168; 19 illustrations and 4 plates.—W. reports the results of an

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investigation carried on with several collaborators and covering a period of 17 yrs., in which they studied the influence of the various solids and gases occurring in smoke, on 6 varieties of young, deciduous trees. Detailed descriptions of the procedures followed are given. A concd. soln. of H_2SO_4 or HCl applied as a spray had only a slightly injurious action. On the other hand, SO_2 gas and sprays of HF and H_2SiF_6 solns. proved to be very toxic, especially when the plants were exposed to sunlight. The trees were resistent to smoke in the following order: beech, oak, elm, sycamore, birch and ash, the first two being quite resistant, the last two very sensitive.

C. F. MILLER.

Valuation of the manurial residues obtained from the consumption of foods by growing pigs. C. CROWTHER AND A. C. RUSTON. *J. Bd. Agr.* 21, 789–800(1914); *Bull. Agr. Intelligence* 6, 553–6(1915).—Two groups of 5 pigs were fed wheat bran, sharps, pea meal and barley. The % of dry matter in the dung rose steadily as the food-supply was increased, the range being from 16.7 % to 22.6% with one group, and 17.8% to 24% in the 2nd group. Of the fertilizing matter present in the food, the following amts. were recovered in the dung: N 56%, P_2O_5 58%, K 87%, Ca 65%. The % of fertilizing ingredients of food recovered varied with pigs of different ages. With pigs 2–4 months 40% N, 64% P_2O_5 and 77% K were recovered in the dung; with pigs 4–6 months, 51% N, 64% P_2O_5 and 86% K were recovered; with those 6–8 months 63% N, 51% P_2O_5 and 91% K were recovered. J. J. SKINNER.

Observations on the plants of highly alkaline soils. B. KELLER. *Pédologie* 16, 11–32(1914); *Bull. Agr. Intelligence* 6, 677–9.—Osmotic pressure of plants in dry lands is much lower than in damp lands and there are also differences relating to root depth, all depending upon concn. of soil soln. W. H. FRY.

The calcifugal character of the lupin. T. PFEIFFER AND E. BLANCK. *Mitt. Landw. Inst. Kgl. Univ. Breslau* 8, 201–33(1914); *Bull. Agr. Intelligence* 6, 399–401. —From the results of 3 yrs. investigation on the behavior of lupins toward lime, P. and B. deduce the following conclusions: Crushed limestone has a less toxic action than other forms of $CaCO_3$ (chalk, pptd. $CaCO_3$). Gypsum also has an injurious action, although less lime is absorbed from it than from the limestone, showing that organic lime salts are produced more readily by the action of root acids upon limestone than upon gypsum. $(NH_4)_2SO_4$, which is physiologically acid, only has an appreciable injurious action on lupins when applied in very large quantities. The development of root tubercles and the absorption of N are retarded by $Ca(NO_3)_2$ as well as by other Ca compds., so that the possibility that the poor growth is due to a deficiency of N supply is precluded. It is likewise proved that K_2O deficiency is not the cause. The lupin's P_2O_5 content is notably decreased by the effect of limestone and nitrate, even in the presence of a fertilizer rich in P_2O_5. The absorption of Fe by some of the lupins was appreciably decreased by $CaCO_3$, $Ca(NO_3)_2$ and KNO_3, whereas $(NH_4)_2SO_4$ had a somewhat limited favorable effect on its absorption. The work is to be continued. C. F. MILLER.

The fertilizing power and harmfulness of fertilizing materials. A. VIVIEN. *Bull. assoc. chim. Sucr. et dist.* 32, 36–42(1914).—V. discusses the toxic effect of different salts on plant life. The toxic dose of 16 common salts for Bordeaux wheat is given. Sugar beets may be raised on land containing amts. of salts which would be toxic to other plants. The beets absorb the salts and thus the land may be gradually rid of the excess of mineral matter. Beets raised on such land yield a sugar soln. of low purity: H. R. SMITH.

The plant *Acorus calamus* L. (RUSSELL) 17.

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16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Experiments on alcoholic fermentation. G. PARIS. *Boll. ministero di agricoltura industria e commercio* [*B*] 14, 30; through *Ann. chim. applicata* 4, 70(1915).—In fermentation of musts obtained by the common methods of wine-making, the av. yield of EtOH is 0.56 cc. per g. reducing sugar. On sterilizing the fermenting mass by SO_2 and subsequent addition of active raw ferment, the yield can be raised to 0.59 cc. Even better results can be obtained if pure specific ferments that have been habituated to SO_2 are used. The use of pure ferments in sterilized media eliminates foreign ferments and other organisms that live in the must and consume sugar and EtOH.

S. LEVY.

Influence of clarification upon composition of wines. FERDINANDO LA MARCA. *Stas. sper. agr. ital.* 48, 185–232(1915).—Clarification by means of isinglass reduces the amt. of ext. and of tannin, but has no effect on the ash and N content. Wines rich in acid and tannin are those most affected by this means of clarifying. The color is also affected. Gelatin appreciably affects the compn. of wines, causing a decrease in ext., tannin, ash and N compds. and in color. If the gelatin is not sufficiently pure, the organoleptic qualities of wines are also affected. When milk is used as a clarifying agent, the ext. and ash are increased, due to the sugar and ash of milk; tannin and color are decreased, while N substances are slightly increased; the aroma and taste are not a little altered, especially with the use of sheep's milk. Whey is one of the poorest clarifying agents, but good results are obtained when commercial casein is used. White of egg affects but little the compn. and not at all the organoleptic properties. It is one of the best agents. This does not apply to art. egg albumen which commercially is seldom pure. Blood causes a slight decrease in ext. and ash. It is one of the good agents, especially when it is desired to clarify and decolor wines. Fuller's earth does not decrease the amt. of tannin nor of color; the ext. and acid are appreciably decreased. Kaolin has less effect than fuller's earth. Charcoals have more effect in highly colored wines; they cause a slight decrease in ext. and acid, and somewhat

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in tannin, ash and nitrogen compds. For the analysis of the various wines before and after clarifying see original. J. A. LeClerc.

Manufacture of cream of tartar. O. Best. *Met. Chem. Eng.* 13, 613–7(1915).—A review and discussion of the history and development of the manuf. of $KHC_4H_4O_6$ and $C_4H_6O_6$ in the U. S. "Of all processes advocated and carried out in America, the only survivor seems to be the 'roasting process,' which, in some form or other, is practically carried out in every large $KHC_4H_4O_6$ refinery in this country." F. W. Smither.

Comparative experiments on yield of extract on employing the "hemicellutase-temperatur." L. Heintz. *Wochschr. Brau.* 32, 270–1(1915).—In numerous expts. not the slightest indication of the activity of a starch-forming enzyme was discovered. L. W. Haas.

Native wine. A. McGill. Inland Revenue Dept., Ottawa, Canada, *Bull.* 316, 31 pp.(1915).—Analyses of 187 samples collected in Canada. E. H.

The pretended hemicellutase and its utilization for increasing the yield of extract in malt mashes. W. Windisch and H. Foerster. Berlin. *Wochschr. Brau.* 32, 253–6(1915).—Expts. in the lab. and on a practical scale did not furnish the slightest indication of the existence in malt of an enzyme which changes hemicelluloses into starch under the conditions specified by Davis (*C. A.* 9, 690). L. W. Haas.

Non-existence in malt of an enzyme "hemicellutase" which forms starch. C. J. Lintner. Munich. *Wochschr. Brau.* 32, 269–70(1915).—L. draws attention to the fact that starch paste (as was used by C. H. Davis (*C. A.* 9, 690) in his investigations resulting in the discovery of hemicellutase) contains considerable quantities of starch-gels, which are hardly attacked by diastase at ordinary temp. and which do not give a blue coloration with I. Even after diastatic action at 60–65° more or less of such gels may remain. At higher temps. they are transformed into sols which give the characteristic color reaction with I. The detection of the activity of a hemicellutase by the appearance of the blue I-starch coloration may therefore be due to an erroneous interpretation of the above facts. An enzyme which transforms hemicelluloses into starch appears to be a theoretical impossibility from a physiological-chem. standpoint, as it would have to effect changes which can only be attributed to the living cell. L. W. Haas.

Interaction between acid phosphates and carbonates, sulfates and chlorides of calcium and magnesium at various concentrations. H. von Hest. *Jahrbuch Versuchs-Lehranstalt Brau., Berlin* 1914; through *Wochschr. Brau.* 31, 389(1914).—These reactions were studied in solns. of the pure salts at different temps. Of special interest was the transformation of insol. tri-Ca and tri-Mg phosphates formed at the b. p. into sol. acid phosphates as the solns. cooled. This is of practical significance in brewing, for a loss in phosphates results when the wort after being boiled is separated from the sludge in the hot state. L. W. Haas.

Deposition of large quantities of calcium oxalate in beers. H. Will. Munich. *Z. ges. Brau.* 38, 105–6, 115–6(1915).—"Crystal turbidity" of beer due to deposited Ca oxalate, is not infrequently observed. Expts. with different fermentation organisms which possibly could be held responsible for the formation of such abnormal quantities of oxalic acid did not lead to any definite conclusion, but it seems probable that the compn. of wort is the main factor. H. believes that Ca oxalate in larger quantities occurs more frequently in beer than suspected, but that it escapes detection if it is not caused to deposit by special conditions, affecting a change of equil., *e. g.*, pasteurizing or coagulation of protein substances acting as protective colloids. L. W. Haas.

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Final degree of fermentation of beer; its regulation and its relations to the degree of fermentation of cask and finished beer. K. WINDISCH. Hohenheim. *Wochschr. Brau.* 32, 285–8(1915).—A critical review. L. W. HAAS.

Worts of 1914 with regard to their protein and mineral matter contents. F. SCHÖNFELD AND H. KRUMHAAR. *Wochschr. Brau.* 32, 256–7(1915); cf. *C. A.* 8, 1637, 2026. —Exptl. data with reference to ext., final degree of fermentation, total N, assimilable N, ash, CaO, MgO, total P_2O_5, inorg. P_2O_5, org. P_2O_5, and SiO_2. The results are compared with the corresponding average values for worts of 1913 and 1914. L. W. H.

Pitch sizer "Regenerite." H. KEIL. *Wochschr. Brau.* 32, 129–31(1915).—"Regenerite" consists of paraffin- or stearin-like substances, most probably waste products of candle manuf. It has a brown-black color and is odorless and tasteless; it feels like paraffin to the touch; m. 45° (unsharp); its viscosity is 1.39′ at 150° and 1.30′ at 200° compared with water at 20°; it is sol. in alc.-ether, leaving only about 2.2% residue; ash = 0.19%; acid degree = 8.7. Practical tests with mixts. of "regenerite" and fresh and used pitch led K. to the conclusion that the prepn. is a suitable pitch sizer and is, if added to pitch in proportions up to 10%, without detrimental influence on the taste of beer. L. W. HAAS.

Food balances of raw materials in alcoholic fermentation (VÖLTZ) **11C. Phosphatases of malt** (ADLER) **11A. Feed value of brewed hops, dregs and yeast** (VÖLTZ) **12. Nutritive value of yeast and the production of durable fodder from yeast** (BRAUER) **12. Rum as sugar factory by-product** (BIRD) **28.**

Brit., 12,109, May 16, 1914. P. WILKINSON. Machines for carbonating beer, stout, etc.

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17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

Annual report on the new remedies of 1914. R. LÜDERS. *Z. angew. Chem.* 28, I, 325–8, 336–40, 345–6, 354–6, 361–3(1915).—A thorough review with bibliography. E. J. C.

Note on the detection of β-napthol in lysol and similar preparations. R. BENANTE. *Analyst* 40, 341–3(1915).—One cc. of the suspected lysol is dissolved in distd. water and dild. to 100 cc. A soln. of lysol free from β-naphthol, of the same strength, is used as a control. On adding 1 cc. of diazotized benzidine chloride soln. the pure lysol soln. gives an orange-colored soln., but if as little as 0.2% β-naphthol is present a fine red color is developed. Care must be taken to compare solns. of the same strength. The benzidine reagent is made as follows: 1 g. benzidine, 4 cc. concd. HCl and 1 g. $NaNO_2$ are dild. to 100 cc. with water and neutralized. The reagent does not keep well. P. B. DUNBAR.

Gynocardic acid. I. OSTROMISLENSKII AND A. M. BERGMAN. *J. Russ. Phys. Chem. Soc.* 46, 1339–40 (*Proc.*) 1914.—*Gynocardic acid*, from *Ol. chaulmoograe*, is a new isomer of oleic acid, m. 67.5–8.5°. Its Cu salt will probably be valuable in chemotherapy. H. M. GORDIN.

Progress in the chemistry of ethereal oils and perfumes. A. RECLAIRE. *Z. angew. Chem.* 28, I, 369–74(1915); cf. *C. A.* 9, 235, 509.—This review covers the period from July, 1914 to Aug., 1915. E. H.

Formamint. Report of the Council on Pharmacy and Chemistry. W. A. PUCKNER, Secretary. *J. Am. Med. Assoc.* 65, 816–9(1915).—The extravagant claims of the pro-

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prietors of "Formamint" are reviewed, also the results of alleged investigations concerning the therapeutic, germicidal, and prophylactic properties of the prepn. This medicine, which has been widely advertized in Europe for a number of years, is now on the American market. It appears to be lactose impregnated with HCHO to the extent of about 2%. The claim that it is a new definite chem. compd. is not proven, and on this ground its patent was annulled in Berlin Nov. 29, 1913. Its germicidal action according to expts. in the Assoc. lab. is no greater than the same amt. of HCHO from any other source. As a throat disinfectant its action is slight, but it may produce marked irritation of the intestinal tract. The claim that the saliva liberates HCHO from formamint in the nascent state, in which condition it is strongly germicidal but *less* irritating than in the ordinary condition, could not be confirmed.

L. W. RIGGS.

Determination of volatile esters in citrus oils and extracts. ALAN R. ALBRIGHT AND CHARLES O. YOUNG. *J. Am. Chem. Soc.* 37, 2382–7(1915).—To det. the volatile esters, 100 g. of the oil in a 3-bulb Ladenburg flask is slowly distd. (18–20 drops per min.) under 2–5 mm. in a hemispherical Fe air bath; when limonene ceases coming over, a long condenser is connected to the flask and steam passed through it until the distillate amounts to 200 cc. (30–45 min.), the vol. of the liquid in the flask being kept as nearly const. as possible; the calcd. amt. (or an excess) of $H_2NCONHNH_2.HCl$ and NaOAc in concd. aq. soln. is added, the mixt. shaken a few min. with 100 cc. of 95% alc., allowed to stand 10–5 min., neutralized to phenolph., boiled under reflux for 2 hrs. with 50 cc. of 0.5 *N* KOH, at once cooled and titrated with 0.5 *N* HCl. In the case of lemon extracts, 400 g. are distd. to 50–75 cc. in an ordinary side-neck flask and then steam-distd. until no more volatile oils pass over, the distillate being treated as above. Condensation with $H_2NCONHNH_2$ is recommended as a general procedure as a preliminary to detn. of the sapon. value when aldehydes are present. If the nonvolatile or resinous parts of the oil are not removed, satisfactory end points in the titration cannot be obtained on account of the murkiness of the soln., so the steam distn. is essential. These resins themselves have a sapon. value; the resin from 100 g. of a lemon oil weighed 2.6 g. and on sapon. showed an apparent linalyl acetate content of 1.15 g. The amt. of linalyl acetate, calcd. from the values obtained by sapon. of the pure ester under the best conditions, was 85.3% of that actually present, while that obtained in artificial mixts. of the ester with citral and limonene and subjected to the above treatment was on an av. 78.4%, indicating a const. loss of about 7%; to obtain almost exactly the true content of saponifiable matter, calcd. as the ester, the apparent value must therefore be multiplied by 100/78.4 = 1.28. C. A. R.

Chemical and physical properties of oils distilled from the various parts of the plant Acorus calamus, L. G. A. RUSSELL. *J. Am. Chem. Soc.* 37, 2387–94(1915).—Oils were obtained by steam distn. of fresh tops, dried rhizomes and dried roots of calamus grown in Madison, Wis., air-dried rhizomes from Bell, Md., and dry rhizomes obtained on the market. They showed the following properties, resp.: Yield, 0.123, 0.638, 2.50, 0.95, 1.493%; d_{25} 0.9509, 0.9547, 0.9491, 0.9938, 0.9945; $[\alpha]_D^{23}$ 12.2°, 21.7°, 18.7°, ——, ——; n_D^{23} 0.5035, 1.4990, 1.5065, 1.5140, 1.5080; acid no., 0, 0, 0, 8.15, 8.75 (8 weeks after distn.); ester no., 12.6, 15.5, 23.7, 55.3, 42.5; sapon. no., ——, ——, ——, 63.45, 48.25; acetylization no., 53.05, 38.40, 42.10, ——, ——. The solubility in 70 and 90% alc. decreases in the order: rhizomes, tops, roots. Tests for phenols gave negative results, while Schiff's reagent showed aldehydes increasing in amt. in the order: tops, rhizomes, roots. All the oils contain small amts. of sol. and insol. combined acids; in that from the tops butyric and enanthylic acids were identified. Each oil was sepd. into 7 fractions under 14 mm.; the consts. of the individual fractions are reported in tables. R. concludes that the plant grown in upland soil yields less

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oil than that grown in its natural habitat, and that the components of the oils from the tops, rhizomes and roots are present in varying amts. and also vary to some extent (in character). CHAS. A. ROUILLER.

New color reaction for papaverine. L. E. WARREN. *J. Am. Chem. Soc.* 37, 2402–6(1915).—If a very small amt. of pptd. papaverine ferricyanide, after being washed with a little H_2O, is dissolved with stirring in a few drops of H_2SO_4 containing a little HCHO, a light blue color is produced at once; after a few min. it changes to bluish (sometimes purplish) violet, then green at the edges and finally emerald-green; finally it fades to a dirty brownish yellow or becomes almost colorless; 30–40 min. are required for completion of the reaction. With some variations the same succession of colors is noted when finely powdered papaverine alkaloid mixed with powdered $K_3Fe(CN)_6$ is stirred with Marquis' reagent; in this case the initial color is faintly greenish blue rather than pure blue and the emerald-green stage is not very pronounced. The test was applied to some 38 other alkaloids; in most cases either no color was produced or the color was not different from that in controls containing no $K_3Fe(CN)_6$; in no case was there a duplication or simulation of the papaverine reaction. Substitution of various other oxidizing agents for $K_3Fe(CN)_6$ in the papaverine test in many cases gave similar colors; the results with Fe, Ag and U salts were not very satisfactory; with bromates, chlorates and nitrates the oxidation was apparently too rapid to give a satisfactory play of colors; NH_4 vanadate, Ce oxide, $KMnO_4$ and selenious acid were as satisfactory as any of the various substances tried. A minute crystal of $KMnO_4$ intimately mixed with 0.0005 g. papaverine and stirred into about 0.2 cc. Marquis' reagent gave a green color which almost instantly became blue and deepened into an intense violet-blue becoming after some time bluish green, then green and finally dirty brown. As with $K_3Fe(CN)_6$ other alkaloids do not duplicate the papaverine reaction with $KMnO_4$; codeine and dionine give colors somewhat confusing but comparison with papaverine shows distinct differences. Likewise an unnamed alkaloid (or mixt. of alkaloids) sepd. from sanguinaria gave with certain oxidizing agents a play of colors somewhat similar to that produced by papaverine; selenious acid however produced an initial intense purplish violet instead of the fugitive greenish blue of papaverine; the new alkaloid differs also in its solubility in NH_4OH, the comparative solubility of its ferricyanide in H_2O, and the purplish violet, instead of deep rose, produced by Marquis' reagent. CHAS. A. ROUILLER.

Ampoules. HERBERT SKINNER. *Pharm. J.* 95, 5–6(1915).—Directions for filling 2 styles of ampoules are given. S. WALDBOTT.

Ampuls. HERMAN H. NORTH *J. Am. Pharm. Assoc.* 4, 567–75(1915).—A review including comments on the evolution of the word "ampul or ampoule," the manuf. of ampuls and the methods of filling them. M. I. W.

Three interesting incompatibilities. WILBUR L. SCOVILLE. *J. Am. Pharm. Assoc.* 4, 590–4(1915).—A review of the literature relating to the action of light on the organic acid salts of the cinchona alkaloids and the production of an isomeric and toxic compd. like cinchonicine or cinchotoxine. The second incompatibility is that of the action of ferric salts on organic acids induced by light. Ferric salts of the organic acids, notably citric, tartaric and lactic acids, are among the more sensitive of the organic compds. They are readily reduced by light to the ferrous condition. Amber bottles inhibit this action. The third incompatibility deals with combinations of glycerol with boric acid and is probably due to the production of glyceroboric acid which is analogous to glycerophosphoric acid and much more active chemically than boric acid. M. I. W.

New method of making Syrupus hypophosphitum, U. S. P., and Syrupus hypo-

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phosphitum compositus, U. S. P. F. A. UPSHER SMITH. *J. Am. Pharm. Assoc.* 4, 595–6(1915); see *C. A.* 9, 1664. M. I. W.

The analysis of Datura stramonium Linné. L. E. SAYRE AND H. V. CADWELL. *J. Am. Pharm. Assoc.* 4, 602–4(1915).—A sample of stramonium, gathered in Kendall Co., Illinois, was analyzed according to a modification of the Dragendorff method. No quant. detn. of the alkaloids is reported. M. I. W.

Iodine ointment; data and method of assay. LEO H. FRIED. *J. Am. Pharm. Assoc.* 4, 621–3(1915).—The free I is detd. by dissolving from 3 to 5 g. of the ointment in about 30 cc. of $CHCl_3$, washing the soln. with 30 cc. of distd. water to remove the KI and glycerol and then titrating with 0.1 *N* $Na_2S_2O_3$. The KI is detd. by weighing about .5 g. of ointment into an ordinary 250 Erlenmeyer flask, adding a mixt. of 5 cc. H_2SO_4 with 150 cc. of distd. water, then a few pieces of pumice stone and about 5 g. of ferric alum. The flask is connected by means of a suitable condenser with a receiving flask and the total I is then driven off by means of heat. The distillate may be titrated with 0.1 *N* $Na_2S_2O_3$. M. I. W.

Magnesium phosphate in poppy capsules. J. E. KIMLEL. *J. Am. Pharm. Assoc.* 4, 623–4(1915).—Magnesium phosphate, present in poppy capsules or in fluid prepns. of the capsules, when the drug or prepn. is assayed for opium alkaloids, may be converted into insol. $Mg(NH_4)PO_4$ which crystallizes out along with the morphine. If this residue is weighed and calcd. as morphine, without further purification as is sometimes done in the assay of opium, the result will not show the correct morphine content. M. I. W.

The quality of commercial Blaud's pills. L. E. WARREN. *J. Am. Pharm. Assoc.* 4, 624–7(1915).—An exam. of com. samples of Blaud's pills showed considerable variation among the several brands and also considerable variation among pills of the same brand. The results of the exam. generally refute the commonly assumed instability of ready-made Blaud's pills, and demonstrate that the nascent prepns., the soft mass pills, and the gelatin encapsulated oily suspension show no advantage over the ordinary kinds. M. I. W.

Comparison of the pharmacopeial methods for the digestive ferments and animal products adopted by the different countries. HOWARD T. GRABER. *J. Am. Pharm. Assoc.* 4, 686–90(1915); cf. *C. A.* 8, 2453.—A review of the requirements for the standardization of pepsin, pancreatin, purified oxgall and desiccated thyroid gland. M. I. W.

A possible source of error in some alkaloidal assays. P. A. W. SELF. *J. Am. Pharm. Assoc.* 4, 695–8(1915); see *C. A.* 9, 1667. M. I. W.

Greasy cold creams. ERNEST R. JONES. *J. Am. Pharm. Assoc.* 4, 708–14(1915).—A review of the compn. of this class of prepns. and the method of making, perfuming and marketing them. Greasy cold creams are essentially emulsions, brought about by the formation of a soap by the alkaline borax soln. and the free cerotic acid of the wax, the soap acting as an emulsifying agent. White beeswax, paraffin or ceresin, colorless liquid petrolatum (mineral oil), borax and water in proper proportions form the best creams. Creams made from the above ingredients are more permanent than when vegetable oils are used and do not turn rancid. Much attention should be paid to obtaining tight-fitting covers for the jars to guard against loss of water. M. I. W.

Redistilled water versus sterilized distilled water. WM. GRAY. *J. Am. Pharm. Assoc.* 4, 816–7(1915).—Distd. water as ordinarily handled contains traces of metal and of NH_3 and numerous bacteria. Simple boiling does not remove these contaminations and the one safe procedure is redistg. the water for parenteral injections in suitable app. of hard glass. M. I. W.

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Emetine hydrochloride as an amebicide and hemostatic. FRANCIS E. STEWART. *J. Am. Pharm. Assoc.* 4, 797–803(1915).—A review of some of the recent literature. M. I. W.

The British Pharmacopeia of 1914. FRED. B. KILMER. *J. Am. Pharm. Assoc.* 4, 900–3(1915).—A general review from the Brit. point of view. M. I. W.

The pharmacy and materia medica of the British Pharmacopeia of 1914. GEORGE M. BERINGER. *J. Am. Pharm. Assoc.* 4, 904–10(1915).—A review. M. I. W.

A new method for the quantitative separation of strychnine and quinine. G. N. WATSON. *J. Am. Pharm. Assoc.* 4, 935(1915).—The chloroplatinate of strychnine is nearly insol. in water, is insol. in alc. and practically insol. in a mixt. of alc. and dild. HCl. The chloroplatinate of quinine is sol. in water and very readily sol. in the alc.-HCl mixt. M. I. W.

Ipecacuanha: Botanical source, medicinal value. MRS. HAMPTON RAY KENASTON. *J. Am. Pharm. Assoc.* 4, 938–41(1915).—The annual importations of ipecac into the United States are about 36,500 pounds, the larger portion of which comes from Colombia. M. I. W.

The quality of commercial sugar of milk. J. W. ENGLAND. *J. Am. Pharm. Assoc.* 4, 944–5(1915).—Practically all of the sugar of milk sold in this country is of American manuf. Of 17 samples examd., the percentage of lactose, as detd. by the polariscope, was not less than 99.73% in any of the samples. The ash content varied from 0.006 to 0.23 and the N content from 0.0037 to 0.03. M. I. W.

Some experiences with salol-coating of pills. J. C. AND B. L. DE G. PEACOCK. *J. Am. Pharm. Assoc.* 4, 947–50(1915).—Outline of the process for the coating of pills with salol to render them insol. in the stomach. M. I. W.

The pharmacy of oxypinene. HENRY C. BLAIR. *J. Am. Pharm. Assoc.* 4, 942–4 (1915).—Oxypinene is an ozonide of pinene, a compd. consisting of one or two mols. of ozone linked to one mol. of pinene ($C_{10}H_{16}$), the active and chief constituent of oil of turpentine. It is produced in 2 forms, a vapor and a pale yellow liquid of honey-like consistency. On contact with moisture it breaks down into H_2O_2, oxides, aldehydes, and ketones or pinene. Exposed to high temp. autoöxidation takes place. Mixed with diatomaceous earth, 1 part to 2 parts, it makes a suitable powder for dressing ulcers and old wounds. M. I. W.

White mineral oils: American, paraffinum liquidum, liquid petrolatum. S. L. HILTON. *J. Am. Pharm. Assoc.* 4, 990–2(1915).—A report on the exam. of 15 samples of American mineral oil. The sp. gr. varied from 0.842 to 0.870. Three of the samples showed a distinct blue fluorescence and two of them had a slight petroleum odor. Only 3 samples gave more than a pale brown color with H_2SO_4. M. I. W.

Liquid petrolatum. JOSEPH P. REMINGTON. *J. Am. Pharm. Assoc.* 4, 933–4 (1915).—Outline of the proposed U. S. P. IX requirements for liquid petrolatum. M. I. W.

Liquid petrolatum, Russian and American. E. H. GANE. *J. Am. Pharm. Assoc.* 4, 792–6(1915).—Russian and American petroleums are different in comp. American oil consists mainly of methane hydrocarbons with some olefins, while Russian oil is composed of naphthene hydrocarbons. Twelve samples of American oil were examined. The sp. gr. varied from 0.840 to 0.857. Four of the samples gave a brown color with the lead oxide test. Three samples gave a dark brown color and one a black color with H_2SO_4. Seven of the samples were fluorescent and only four of them were considered really fit for medicinal use. M. I. W.

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Increase in the acidity of hydrogen peroxide upon standing. C. F. RAMSAY AND A. M. CLOVER. *J. Am. Pharm. Assoc.* 4, 1108–11(1915).—The unusually high acidity frequently noted in peroxide which contains acetanilide is due in most cases to an oxidation of the preservative. A soln. of H_2O_2 practically free from all impurities will lose nearly 50% of its strength, if kept for a year in a glass-stoppered bottle in the dark. By adding a small quantity of acetanilide to the soln. the decompn. is reduced to 3%. Acetanilide added to a peroxide containing impurities results in the complete destruction of the benzene ring, apparently with the formation of substances having a high acid value. M. I. W.

Quinoidine (MACGILCHRIST) III.

WERNER, C.: **A Textbook on Tobacco.** New York: Tobacco Leaf Pub. Co. 323 pp. $1.50.

Brit., 11,836, May 13, 1914. CHEMISCHE FABRIK AUF ACTIEN (v. E. SCHERING). **Arylcinchoninic acids** are prepd. by adding less than 1 mol. proportion of pyroracemic acid to a boiling alc. soln. of benzylideneaniline or other condensation product of an aromatic amine and an aromatic aldehyde. The condensation may be effected in soln. in dil. alc. and the pyroracemic acid is preferably added cold.

Brit., 12,141, May 16, 1914. C. BÜCKEL. **Acylarylsulfonimides** are obtained by reaction of arylsulfonamides with halides of higher fatty acids. According to examples, Na benzenesulfonamide and stearyl chloride, and *p*-toluenesulfonamide and palmityl chloride, are used. The products form alkali, alk.-earth, and heavy-metal salts, and are suitable for use as emulsifying agents for oils, fats, soaps, hydrocarbons, phenols, etc., in the production of liniments, ointments, detergents, lubricants, etc. According to examples: Vaseline is mixed with palmityl-*p*-toluenesulfonimide, giving a product m. at 75°; an ointment is prepd. by mixing olive oil, stearyl-*p*-toluenesulfonimide, and H_2O; an emulsion for medicinal use is prepd. by mixing cod-liver oil, NH_4 palmityl-*p*-toluenesulfonimide, and H_2O; a detergent emulsion is prepd. from NH_4 palmityl-*p*-toluenesulfonimide, soap, CCl_4 and H_2O; an emulsion suitable as a lubricant for boring-tools is prepd. from K stearylbenzenesulfonimide, soap, lubricating oil, and H_2O; an emulsion suitable as a spinning oil is prepd. from Na palmityl-*p*-toluenesulfonimide, soap, olein, and H_2O; an ointment is prepd. by mixing Ca palmityl-*p*-toluenesulfonimide, olive oil, and H_2O; an ointment is prepd. from Zn stearyl-*p*-toluenesulfonimide, arachis oil, and H_2O. Emulsions made with the above-described sulfonimides may be used for sprinkling wool which is to be piece-dyed. **Halides of higher fatty acids** are prepd., *e. g.*, by heating stearic acid with PCl_5, or palmitic acid with thionyl chloride, in the presence of CCl_4. Cf. *C. A.* 9, 2130.

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18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

Coöperation in matters chemical. Presidential address. C. H. HERTY. *J. Am. Chem. Soc.* 37, 2231–46(1915).—Address delivered in Seattle at the 51st meeting of the Am. Chem. Soc. E. B. MILLARD.

Applied chemistry. L. H. BAEKELAND. *Met. Chem. Eng.* 13, 677–81(1915); cf. *C. A.* 9, 2295.—An address. E. J. C.

Scientific organization. H. S. HELE-SHAW. *Electrician* 75, 851–6(1915).—English methods of education, research, etc., are compared with German methods. C. G. F.

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Technical school research. W. B. BURNIE. *Electrician* 75, 849–50(1915).—A general survey of the subject. C. G. F.

The relation of research to the progress of manufacturing industries. W. R. WHITNEY. *Ann. Am. Acad. Polit. Soc. Sci.* 1915, No. 5; *Gen. Elec. Rev.* 18, 868(1915). —An address having for its theme: "We in this country are particularly active in putting the useful into the invention but we are less active in the study of the new." C. G. F.

The relation of chemical control to industro-chemistry. EUGENE L. MAINES. *J. Am. Pharm. Assoc.* 4, 911–5(1915).—That successful industries are for the greater part dependent on the chem. lab. and chem. control is evidenced by the number of establishments in which waste has been reduced and efficiency increased. M. I. W.

Resources and possibilities of chemical industry in the Southwest. EDGAR BARUCH. *Met. Chem. Eng.* 13, 604–8(1915).—An address. E. J. C.

Sodium silicate as preservative for preparations evolving oxygen. W. KIND. *Seifensieder-Ztg.* 42, 598–9(1915).—Varying amts. of $Na_2Si_4O_9$ soln. were added to H_2O_2 and the soln. titrated with $KMnO_4$ at 15-min. intervals. It was found that the best stability resulted when from 0.2 to 5 g. of $Na_2Si_4O_9$ are present in $^1/_2$ l. of H_2O contg. 20 cc. H_2O_2. Sodium perborate and Na_2O_2 are made more permanent by the addition of 0.05 to 10 g. $Na_2Si_4O_9$ for every 500 cc. H_2O contg. 2 g. perborate. Several tables are given. E. SCHERUBEL.

Methods of working up horn, tortoise shell and other wastes. H. PUFAHL. *Kunststoffe* 5, 174–5, 197–201(1915).—A review of the methods for the manuf. of plates, combs, knife handles, ornaments, etc. F. W. SMITHER.

DÜCHTING, W.: **Entstaubungs- und Entnebelungs-Anlagen.** Berlin: A. Seydel.

ULLMANN, F.: **Enzyklopaedie der technischen Chemie.** 2 Bd. Wien: Urban & Schwarzenberg. 800 ss. 32 M.

Brit., 11,614, May 11, 1914. R. A. MCQUITTY. **In a process of frosting or graining a base surface** which in some cases is removed to leave an ornamental foil, the base surface is first coated with a varnish consisting of celluloid dissolved in amyl acetate or other solvent, and a vegetable drying oil. When this has dried, the surface is again coated with the same or a similar varnish, or with HOAc or other solvent for celluloid, with the result that the first skin is dissolved in part and, on redrying, dries unevenly. In a modification, the 2nd coating consists of a solvent, alone or combined with varnish, that attacks the oil in the first coating. The varnish may be colored. To produce a varnish foil, the coating is applied to paper which is afterwards removed. The invention is particularly applicable for use in the manufacture of advertisement transparencies, and in the ornamentation of glass such as the globes of elec. lamps.

Brit., 11,635, May 11, 1914. F. E. MATTHEWS and H. M. ELDER. **Addition products of olefin hydrocarbons with sulfur dioxide** are obtained by combination of the hydrocarbons with SO_2; the combination is preferably effected by mixing the components in the liquid state and exposing the liquid mixt. in a sealed vessel to the action of light, *e. g.*, sunlight or ultraviolet light; excess of either component is evapd. off from the reaction product. According to examples, ψ-butylene, propylene, amylene, and ethylene, are employed. The butylene product is sol. in $CHCl_3$ or $C_2H_2Cl_4$, and softens, without dissolving, in $(CH_3)_2CO$; it may be used, alone or mixed with other materials, for the manuf. of films, varnishes, ornamental articles, etc., or may be mixed with celluloid, *e. g.*, by softening both substances by means of $(CH_3)_2CO$, in order to reduce the inflammability thereof.

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Brit., 11,797, Feb. 24, 1913. J. E. BUCHER. **Alkali and alkaline earth cyanides** are obtained by reacting with N or a N compd. upon an alkali or alk.-earth metal or a compd. of such metal, such as disodium cyanamide or sodamide, and molten carburized Fe, with or without additional C. The alkali or alk.-earth metal may be introduced as vapor. The cyanide produced is volatilized.

Brit., 11,959, May 14, 1914. J. W. SPENSLEY and J. W. BATTERSBY. **Alkali silicates** are prepd. in hydrated sol. form from the fused material in lumps or in the granular form obtained by pouring the molten mass into H_2O, by subjecting it in a rotary vessel to the grinding action of moving bodies, such as flints or artificial stone pieces, in the presence of H_2O. The grinding cylinder may be lined with quartz or porcelain in the form of bricks. After the grinding operation, the product may be poured off in a semi-liquid form, and may be allowed to solidify in molds into blocks which can be readily pulverized, or it may be run directly into hot H_2O for prepg. a soln., or may be left in the grinding app. until it has solidified in the form of a powder; or, if a large quantity of H_2O is used in the grinding operation, the product may be a soln. The powdered hydrated silicate may be mixed in any proportions with Na_2CO_3, soaps, disinfectants, etc., and coloring matters may be added. The additional substances may be added in the grinding app., and any gas may be introduced into the app. for excluding air or acting upon the product. The products may be used in powder or tablet form. In the latter case, the small quantity of flint that becomes pulverized is an advantageous ingredient for scouring purposes. In case the "neutral" silicate is treated, more soda or caustic soda may be added when a silicate having an excess of alkali is required.

Brit., 12,079, May 15, 1914. S. A. C. KRISTENSEN. **Fireproofing and waterproofing fibrous and felted substances,** such as paper and hide, by coating one or both sides with mineral powder, preferably Al powder, using water-glass as adhesive. The material may be strengthened before coating by a layer of wire-gauze attached thereto by sewing or by water-glass. The material is stated to be applicable to coverings for walls or furniture, balloons, aeroplanes, boats, packing-cases, boxes, trunks, floor and stair coverings, soles for footgear, and tires.

Brit., 12,136, May 16, 1914. P. RADMANN. **Potassium and other alkali salts** are obtained from alkaliferous rocks and weathering products (especially feldspar) by heating the rock with gypsum with or without limestone while avoiding fusion, and washing out the alkali salts. The materials should be finely ground and well mixed, and the temp. should be about 1000–1250°. The washed residue, with or without an addition of limestone, may be converted into cement by burning.

Can., 162,960, June 1, 1915. C. T. THORSSELL. **A method of evaporation and distillation of liquids** consisting in exposing the vapor generated at or near the critical point of the liquid, when leaving the distn. vessel, to a small fall of pressure and temp. in such a manner that the vapor is condensed.

Can., 163,610, July 6, 1915. J. E. BUCHER. **Process of fixing nitrogen** by bringing it into contact with an extended surface of molten material comprizing as one of the constituent elements a metal capable of combining with N and C and of acting as the base of a stable CN compd. under the temp. conditions of the operation, liberating the metal from the material, combining the metal and N with the C contained in an extended surface of catalytic material contg. dissolved C, to form a CN compd. and maintaining a large extent of surface substantially free from the bulk of molten material, in order to afford free access of the N and metal molecules, the last step being effected in part by distg. off, during the course of the operation, a portion at least of the CN compd. at a temp. below that of the eutectic point of the catalytic material.

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Can., 163,798, July 20, 1915. S. PEACOCK. **The process of fixing atmospheric nitrogen during the process of graphitizing carbon shapes** by covering the shapes with a mixt. of C and oxides, and raising the shapes to the graphitizing temp. and the mixt. to a carbide-forming temp., while passing free N over the mixt., and thereby converting the oxides into nitrides. Cf. *C. A.* **9**, 2295.

19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

Structure and properties of glass. G. QUINCKE. *Ann. Physik* **46**, 1025–53(1915). —According to Zschimmer glass is a supercooled liquid of very great viscosity and a more or less homogeneous soln. of the liquid constituents in each other. The first is true but glass is not by any means homogeneous. It is colloidal. The solvent material in glass is molten alkali silicate in which at high temps. the other silicates of Ca, Al, Fe, Zn and also SiO_2 are dissolved. An exhaustive discussion of the various liquid phases is given together with the effects of initial and final temp., duration of heating, rate of cooling, etc. C. H. KERR.

The action of the glass batch in the melting process. HUGO KNOBLAUCH. Freiburg. *Z. angew. Chem.* **28**, I, 281–6(1915); 17 figs.—A general description is given of pots, pot furnaces and tanks. The various mechanical actions of the batch and molten glass within the pot are discussed, especially with reference to successive fills in the melting operation. C. H. KERR.

Pots, rings and chamotte materials prepared in the glass factory. ANON. *Glasind.* **26**, No. 29–30(1915).—Nine recipes of various clay mixts. are given. J. B. PATCH.

Continuous melting of the batch in pot furnaces. BORK. *Glasind.* **26**, Nos. 31–4(1915); 5 figs.—A melting system for a continuous gas-fired and regenerative pot furnace is described. Two separate pots of 2 compartments each comprize the melting and working unit. The molten glass flows by gravity from the 2nd compartment of the 1st pot into the 1st compartment of the 2nd. J. B. PATCH.

The manufacture of mirrors. P. M. *Diamant* **37**, 405–6(1915).—Very brief formulas are given for the deposition of Hg, Ag, Cu and Au mirrors by chemical means. J. B. PATCH.

The production of wire glass. FR. SCH. *Diamant* **37**, 465–6(1915); 5 figs.—A method for the manuf. of wire glass is explained with the aid of figs. J. B. P.

Unbreakable glass. B. *Diamant* **37**, 485–6(1915).—"Cellon" is a product made by the action of AcOH upon cellulose. It is as transparent as window glass and resembles celluloid very closely except that it is non-inflammable. J. B. PATCH.

Some facts about kaolin. W. W. HUGHES. *Brick and Clay Rec.* **47**, 272–3(1915); cf. *C. A.* **9**, 2135.—A brief discussion is given of the history, uses, and process of preparing domestic china clay. ROBT. BACK.

An American kaolin industry. H. WINSLOW FEGLEY. *Brick and Clay Rec.* **46**, 857–9(1915).—A description of a plant in Pa. and its operation. ROBT. BACK.

Burning black flashed brick. W. C. RATHFON. *Brick and Clay Rec.* **46**, 1130–1 (1915).—The process of flashing to produce practically black brick is described. ROBT. BACK.

The manufacture of promenade and quarry tile. E. T. MONTGOMERY. *Brick and Clay Rec.* **47**, 19–21, 111–2(1915).—M. describes the manuf. of these tile in detail according to the best factory practice of today. The 4- and 2-tile dies are not consi dered possible for the manuf. of high-grade floor tile, manufacturers having settled on the single-tile die. The process used at the Kushequa, Pa., plant is described. R. B.

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The legal interpretation of the word "vitrified" as applied to ceramic products. EDWARD ORTON, JR. *Clayworker* 64, 35–7, 90–6(1915); cf. *C. A.* 8, 3712.—O. discusses (1) The proper definition of clay products; (2) the chem. meaning of vitrification; (3) the differentiation of vitrification and fusion; (4) the physical conception of vitrification, color, texture, hardness, strength, sp. gr., and compactness or freedom from voids being some of the properties considered; (5) doing away with the machine structure; (6) developing sponginess by overfire; (7) gas blebs *vs.* pores; (8) the permissible absorption limits; (9) vitrification to safeguard against frost; (10) vitrification to insure impermeability; (11) vitrification for insulating material; (12) status of existing specifications. ROBT. BACK.

Drying of clay wares. ELLIS LOVEJOY. *Clayworker* 63, 656–7, 754–5(1915); 9 figs.; cf. *C. A.* 9, 1679.—A brief discussion of the merits and efficiency of a radiated heat drier and the type of plant to which these driers are best adapted. *Ibid* 64, 25–6 154–5; 7 figs.—The operation of steam progressive driers and waste heat progressive driers from an economic standpoint is discussed. ROBT. BACK.

New machine for clayworkers. ANON. *Brick and Clay Rec.* 46, 970(1915); 1 fig.—A proportioning device is described particularly adapted to those plants that mix two or more materials for the body. Exact percentages of each material are delivered to the conveyor and the batch is always uniform. It cuts the cost of manuf. and serves equally well on brick plants where shale and fire clay, fire clay and Mn, (or iron oxide) are mixed; it can be adjusted to suit any desired output. The machine has been used successfully at terra cotta plants. ROBT. BACK.

Electric enameling ovens. ANON. *Am. Machinist* 43, 598–600(1915).—Description of furnaces in operation at the Stenotype Co., Indianapolis. C. G. F.

MARSHALL, A. E. AND WINSHIP, W. W.: **Bibliography of Fused Silica.** New York: Thermal Syndicate.

SELCH, E.: **Der Einfluss der basischen Flussmittel auf die Haarrissigkeit und den Schmelzpunkt von borsäurefreien Bleiglasuren.** 2 Aufl. Berlin: Keram. Rundschau.

Ger., 283,551, Oct. 28, 1913. E. MOHR and H. WIELAND GEB. SCHMITZ. **In the manuf. of polychromatic screen plates of glass,** for the production of photographs in natural colors, small glass spheres of suitable color and size are applied upon one side of an uncolored glass plate, in closest proximity, and fused, so that the colored side forms a smooth surface adapted to receive the sensitive coating. The microscopic glass beads are obtained by pulverizing the proper kinds of glass to a fine powder, and then fusing these, separately, while in motion, to spheres. This is accomplished by allowing the powder to fall through a blast flame. The resulting spheres can be sorted, by blast, according to size. The adhesive used for holding the glass spheres upon the surface of the plate must be chosen with a view to its complete volatilization or combustion during the fusion process. The plate, while still soft from the heating operation, may be rendered smoother by rolling or pressing.

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20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

An air analyzer for determining the fineness of portland cement. J. C. PEARSON AND W. H. SLIGH. Bur. of Standards, *Tech. Paper* No. 48, 74 pp.(1915); see *C. A.* 9, 2444. E. J. C.

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The Fleming dust collecting system. W. C. HANNA, JR. *Elec. Power and Gas* 35, 143–7(1915); *Met. Chem. Eng.* 13, 609–12(1915).—An illustrated article describing the application of this system to the plant of the California Cement Co. The installation consists of normal rotary kilns using dry process and oil for fuel. The draft is produced by fans sucking at the end of the separate flues. From here the exhaust gas and dust go through a large settling chamber where 90–95% of the dust is deposited. The finer dust then goes through a series of seven baffle chambers where the last of the dust is captured by sprays of H_2O. Much of the lime and alkalies in the gases is also dissolved. Results have been extremely satisfactory as about 24% more clinker is obtained per barrel of oil consumed, and the quality of the output is improved.
W. E. RUDER.

Present status of adhesive and cohesive tests of bituminous materials. J. S. CRANDALL. *Science* 41, 801–2(1915).—Satisfactory tests were made on the material molded into cylindrical briquets under a pressure of 500 or 750 kg. per sq. in., and properly seasoned. The best size was found to be 35 mm. high and 50 mm. in diameter. The briquets were tested in a Page impact machine that is used for the cementation test of stone. These tests furnish a means of comparing strengths of binders and control of the amts. of binder, stone, sand, and filler to use. L. W. RIGGS.

Purchase of asphalt on the bitumen basis (BROADHURST) 22. Allowable penetration of asphalts for pavements (PULLAR) 22.

GAMANN, H.: **Zement und Beton im Tiefbau.** Berlin: Tonindustrie Zeitung. 299 ss. 8 M.

Brit., 12,073, May 15, 1914. E. J. LOVEGROVE and N. G. CROMPTON. In the manuf. of a **grouting for making, dressing, and similarly treating roads,** native bitumen, or bitumen from asphaltic oils, is mixed with very finely ground ash, refuse-destructor clinker, or like residue of combustion, in the proportion of 30–70% of the former. The material may be applied upon macadam roads or roads formed of granite setts or wood blocks, by flowing it and distributing with a brush; or it may be forced in under pressure. The fine dust which is produced during the crushing operation, and is not usually collected, is gathered by means of a fan, or after the crushing is finished, and is particularly suitable for the purpose specified. Cf. *C. A.* 9, 2303.

Can., 163,849, July 20, 1915. L. P. BASSET. **Manufacture of cement and hydraulic lime** by the decompn. of $CaSO_4$ in the presence of clay with simultaneous production of H_2S, O_2, or S, consisting in decompg. the $CaSO_4$ by means of an excess of CaS and subsequently destroying the excess by an oxidation. Cf. *C. A.* 9, 960.

Fr., 19,612, addition to 466,878, June 29, 1914. R. HOUBEN. Process of mfg. an **elastic impermeable concrete,** consisting in mixing with the concrete while in a pasty state, prepd. in the usual manner, a pulverulent absorbent and elastic material, such as sawdust, previously satd. with an impervious substance such as tar or a mixt. of tar and bitumen.

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21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

Nature of the compounds of nitrogen in coal and coke. E. TERRES. *Chem. Ztg.* 39, 73(915).—Glycocoll, asparagine, albumin, glue, pyridine, azobenzene, hydrazobenzene, acetonitrile, phenyl isocyanate, and nitrobenzene were destructively distd.

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in a manner similar to coal distn. Only those substances containing amino or substituted amino groups yielded NH_3. It is concluded, therefore, that the substances in coal yielding NH_3 are probably albuminous. Exts. with organic solvents contained more N than the insol. residue, but the presence of amino groups in the exts. could not be proved. Coke with steam at high temp. gave 89% of its N as NH_3 if precautions were taken to prevent decompn. This agrees with the assumption of Rau and Christie that N of coke is present as nitride of C. H. C. BERMAN.

Field apparatus for determining ash in coal. C. E. LESHER. U. S. Geol. Survey, *Bull.* 621-A, 1–12(1915).—L. describes app. essential and sufficient for a portable outfit including Barthel's gasoline blast lamp. Results accurate to 2% can be obtained. R. C. WELLS.

Gaseous combusion at high pressures. W. A. BONE, H. DAVIES, H. H. GRAY, H. H. HENSTOCK AND J. B. DAWSON. *Trans. Roy. Soc. London* (*A*) 215, 275–318 (1915); cf. *ibid* 87, 910, 1236(1905); 89, 652, 660, 939, 1614(1906); *C. A.* 9, 2582.—Two special bombs were used, one of about 100 cc. capacity and the other about 275 cc. A series of expts. was carried out in which CH_4 was exploded with less than its own vol. of O_2 at pressures from 8.5 to 31 atms. The explosions at initial pressures up to 16 atms. were not very violent, but detonation was probable at 31.25 atms. There was always a deposition of C, steam was formed, and there was permanent increase of 20 to 30% in pressure. Next the quantity of O was gradually increased from ($2CH_4 + O_2$) to ($CH_4 + O_2$) at pressures of about 12.7 atm., and the deposition of C was shown to have ceased when the compn. of the mixt. was $3CH_4 + 2O_2$. The "hydroxylation" theory of combustion is discussed, and the expts. of Thornton cited as further proof of the theory (*C. A.* 8, 3498). In mixts. of the type $CH_4 + O_2 + 2H_2$ and $CH_4 + O_2 + 2CO$ the CO was apparently more effective than H_2 in pulling O_2 away from CH_4. A mixt. as rich in H_2 as $C_2H_4 + O_2 + 8H_2$ (new series of expts.) could be exploded without causing any deposition of C, and there was never any trace of C_2H_2 in the products. The mixt. $C_2H_6 + O_2$, according to the hydroxylation theory, should go through C_2H_5OH to $C_2H_4(OH)_2$, which would then decompose into CH_2CHO and steam, then into C, H_2, CH_4, and CO. Finally, a series of expts. at high initial pressures (50 atms.) with various gas mixts. was carried out. The H_2-air mixt. was the "fastest burning," the max. pressure being reached in 0.1 of the time required for $2CO + O_2 + 4N_2$, and in 0.2 of that required for $CH_4 + O_2 + 4N_2$. E. B. MILLARD.

Gaseous combustion and the economizing of coal. W. A. BONE. *Gas World* 63, 237–41(1915); *J. Gas Lighting* 131, 576–81(1915).—An address before the Brit. Assoc., reviewing recent progress. E. J. C.

Heats of formation of compounds formed in the production of gas from carbon. F. HOFFMANN. *Z. angew. Chem.* 28, I, 322–4(1915).—This paper is chiefly a repetition of one previously published under the title, "The constants for weight, volume and heating values of gases for use in thermo-technical calculations." (*C. A.* 9, 521.) E. J. C.

"Gasol:" A new competitor of acetylene. J. F. SPRINGER. *Machinery* 21, 903(1915).—A reduction in the cost of fuel gas in autogenous welding could be attained by using "gasol," a semi-natural gas obtained from waste gas from oil wells. It can be produced at about $0.001 per cu. ft. against $0.01 per cu. ft. for C_2H_2. CH_4 is eliminated from the crude gas before it is liquefied. The residual gas is liquefied by applying 850–900 lbs. per sq. in. at ordinary temp. The liquefied gas has a sp. gr. of 0.5. One lb. of the liquid produces 7 cu. ft. of gas. Z. SMILOVICI.

By-product coke-oven problems and their solution. C. C. BOARDMAN. *Iron Coal Trades Rev.* 91, 36–7(1915).—A general discussion. H. L. OLIN.

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Experimental smoke injuries (WISLICENUS) 15. Occurrence of explosive gases in coal mines (DARTON) 24.

CASTELLANI, L. AND ROMANELLI, U.: **L'acetilene e le sue pratische applicazioni.** 3a ediz. Milano: U. Hoepli. 335 pp. 4 L.

Handbuch für den deutschen Braunkohlenbergbau. 2 Aufl. Halle: W. Knapp. 880 ss. 44 M.

HÜBERS, J.: **Ueber Verwertung der Lignitkohle.** Berlin: Verlag f. Fachliteratur. 1.20 M.

LANGE, K. R.: **The By-Products of Coal-Gas Manufacture.** Trans. by C. Salter. London: Scott, Greenwood & Son. 155 pp. 5 s.

PEEBLES, J. C.: **Furnace Efficiency, Combustion and Flue Gases.** Chicago: J. G. Branch Pub. Co. $1.00.

SIM, J. AND WYLIE, A. M.: **Laboratory Work for Coal Mining Students.** London: E. Arnold. 144 pp. 3 s, 2 d.

Brit., 12,066, May 15, 1914. F. P. PETERSON. **A gaseous mixture.** See U. S., 1,094,864 (*C. A.* 8, 2241).

Brit., 12,153, May 16, 1914. B. GRATZ. **In a furnace for coking briquets,** of the kind comprizing a series of superposed rotary drums through which the briquets are passed in succession, the coking is completed in a sep. chamber rotating at a lower speed than the drums, and unheated or heated only to a slight extent.

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22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

Motor fuels. V. B. LEWES. *Am. Gas Light J.* 103, 165–7, 170–1, 178–81(1915); see *C. A.* 9, 1244, 2707. E. J. C.

New work on mineral oils in 1914. L. SINGER. Düsseldorf, Germany. *Chem. Rev. Fett-Harz-Ind.* 22, 51–3, 61–3, 70–2, 82–3(1915).—A review of the year's literature. A bibliography of 13 titles is appended. P. ESCHER.

Allowable maximum penetration of various types of asphalts for use on the various kinds of bituminous pavements. H. B. PULLAR. *Science* 41, 802(1915).—P. believes that no set rule can be adopted setting a max. penetration for any type of asphalt but that local conditions in conjunction with the various bitumens on the market must be taken into account and specifications so drawn as to get the most satisfactory results. H. L. OLIN.

The purchase of asphalt and asphaltic cement on the bitumen basis. W. H. BROADHURST. *Science* 41, 802(1915).—Since bitumen, or the CS_2-sol. constituent of an asphalt, is the cementing substance which binds the mineral aggregate of an asphalt pavement or concrete together, it follows that the sale of the material should be on the basis of its bitumen content, first as to quality and second as to quantity. H. L. OLIN.

Emergent stem correction for thermometer in creosote oil distillation flasks. R. M. WILHELM. Bur. Standards, *Tech. Paper* No. 49, 21 pp.(1915).—Emergent stem correction errors in creosote oil distn. flasks are discussed, and corrections applicable to a particular type of thermometer when used in any one of 4 different types of distn. flasks were detd. and tabulated. The emergent stem correction may amount to as much as 17° at 350°. The corrections applicable to the different types of flasks do not differ much from each other for similar thermometers read at the same temp.,

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the greatest difference being 2°. From the standpoint of temp. measurement and in particular emergent stem correction there is little to choose between the different types of flasks. The most desirable type of Hg thermometer to use is probably the continuous-scale, graduated-stem type divided into degrees, the length of a degree interval being about 0.8 mm. The thermometer should be "filled under pressure" to prevent distn. of Hg, well annealed to prevent a rise of the readings with continued heating, and should have its scale corrections detd. by a standardizing lab. The undesirability of using a thermometer with an enlargement in the stem between the bulb and the scale is discussed. Thermometers could be scaled to read correctly when immersed to the point at which they were to be used in distn. flasks by making use of the corrections obtained in this paper, but such a procedure is hardly thought justified at the present time. A method suggested for finding the total correction to thermometers used in distn. flasks by reading the thermometer first in the vapor of boiling naphthalene and then in the vapor of boiling anthracene was found to be practicable and sufficiently accurate (about 1° or 2°) for distn. practice. A significant disagreement in the fractions will result if corrections are made in one case for emergent stem and not in another. Tables and curves are given. Cf. Wiebe (*C. A.* **7**, 247); Dean and Bateman (*C. A.* **3**, 244); Buckingham (*C. A.* **7**, 2340). F. W. SMITHER.

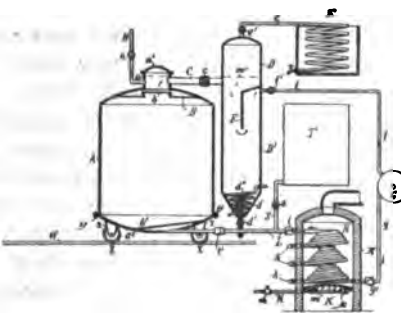
Production of turpentine oil in Russia. A. KIND. *Oil and Colour Trades J.* Apr. 10 and 17, 1915.—The product is obtained by tapping trees and by distn. of the wood of conifers. The districts of greatest production are the regions around Archangel, in the govts. of Wjatka and Perm, Wladimir, Kasan, Kostrom, Wilna, Grodno, Kowno, Minsk, etc. K. examd. 50 samples and concludes, contrary to the general opinion, that oil of good quality can be produced by dry distn. in Russia. E. SCHERUBEL.

Pitch sizer "Regenerite" (KEIL) 16. The Healdton oil field, Carter Co., Oklahoma (WEGEMANN) 8.

HOFER, H.: **Die Nomenklatur in der Erdölwissenschaft.** Berlin: Verlag f. Fachliteratur. 50 pf.

PHILLIPDE, ST.: **Ueber die Zersetzung von Mineralöl beim Erhitzen unter Druck.** Karlsruhe. 48 ss.

U. S., 1,148,104, July 27. B. LOOMIS. Apparatus for distilling wood to obtain turpentine, etc. Wood is placed in the distg. chamber *A* and the app. is filled with H_2O heated by the burner *m'* and circulated by the pump *G*. Turpentine vapors pass through the vapor space *D* to the condenser *E* and rosin settles in the chamber *D'*. *B* is a storage and settling tank for liquor blown off from the distg. chamber.



Brit., 11,611, May 11, 1914. BADISCHE. Treating crude mineral oils, solar oil, and shale oil, which contain satd. and unsatd. hydrocarbons, with a view to hydrogenating them and improving them as regards color and odor, by heating them, in the liquid state, with H, in the presence of Ni, Co, or Cu, or a mixt. of 2 or more of these metals, to a temp. not materially exceeding 200°. The catalytic metal may have its activity increased by the addition of a promoter, *e. g.*, an artificial zeolite may be treated with a Ni salt, and reduced in H; or a soln. containing Ni and Al nitrates may be pptd.

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with a soln. containing K_2CO_3 and K_2SiO_3, and the ppt. formed into lumps and reduced; or $NiCO_3$ and $Al(OAc)_3$ may be heated together, and the mass reduced in H; or Ni wire-netting may be treated with Al_2O_3 or potash. The process may be carried out under pressure of 10 atms. or more, *e. g.*, 20–50 or 120 atms.

Can., 163,091, June 8, 1915. A. M. McAfee. **Improvement of oils by heating** a high-boiling oil with $AlCl_3$ while distg. off low boiling oils formed, cooling the heated oil at a time when a substantial amount of high boiling oil still remains and sepg. the $AlCl_3$ and the oil. Cf. *C. A.* 9, 860.

Can., 163,092, June 8, 1915. A. M. McAfee. **In the conversion of petroleum oils** the process of boiling a body of such oil in the presence of finely divided metal, while leading a current of Cl into contact with the oil.

Can., 163,093, June 8, 1915. A. M. McAfee. **In the purification of high boiling mineral lubricating oils,** the process of warming such oil with dry $AlCl_3$ at a temp. below that at which any substantial amt. of low boiling oils will form.

Can., 163,616, July 6, 1915. C. V. Stuart. **The process of atomizing and burning hydrocarbon,** by inducing a current of air and oil under pressure into a relatively restricted passage, causing the mixt. to travel in a tortuous path and immediately thereafter causing the mixt. to be delivered at an angle against a baffle, then compressing the mixt., and finally causing an expansion of the mixt. immediately prior to combustion.

Can., 163,671, July 6, 1915. A. M. McAfee. **In the treatment of petroleum oils** the process which comprizes continuous distn. of low boiling vapors from a body of high boiling oil containing $AlCl_3$ and continuous supply of fresh oil to the body to maintain its vol. substantially const.

23. CELLULOSE AND PAPER.

A. D. LITTLE.

Scientific study of papermaking. John D. Rue. *Paper* 16, No. 16, 11–3(1915). —Description of courses in paper manuf. at the Univ. of Michigan. V. Nunez.

Technic of paper testing. H. A. Bromley. *Papermaking and Brit. Paper Trade J.* 49, 665–8(1915).—Several well-known instruments for testing the strength of paper are described and compared. V. Nunez.

Structure of wood and some other fibers as related to pulp and paper. H. N. Lee. *Pulp and Paper Mag. Can.* 13, 361–7(1915); *Paper* 16, No. 20, 14–9(1915).—Description of the characteristics, function in the plant, and means of identification of several important fibers. Excellent photomicrographs are given. V. Nunez.

Color. Anon. *Pulp Paper Mag. Can.* 13, 391–3(1915).—General discussion of use of dyes in papermaking. V. Nunez.

Chemistry of papermaking fabrics. J. S. Bates. *Paper* 16, No. 18, 11–3(1915); *Pulp Paper Mag. Can.* 13, 368–70(1915).—General. V. Nunez.

Capacity of sulfite acid towers. A. D. G. Kuhn. *Papierfabr.* 13, 437–42(1915). —In detg. the dimensions of proposed acid towers, past practice should preferably be followed. A table is given of dimensions of seven modern installations. Tall, slender towers are more efficient than shorter towers of greater diam., although their cubic capacity may be less. Towers with several grates show greater acid output per unit of cubic content than towers with a single inclined grate at the bottom, besides offering other practical advantages. V. Nunez.

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Separation of wax from straw. E. HEUSER. *Papier-Z.* 36, 2699–2701; *Z. angew. Chem.* 28, II, 220.—Chopped straw extd. with petroleum spirit yielded 1.18% of soft, dark green wax, which gave 85.2% of light yellow wax when purified with charcoal. Cellulose prepared from the residual straw was more readily bleached than that obtained from the untreated straw. V. NUNEZ.

Carbohydrates of pine wood (HÄGGLUND) IID.

CROSS, C. F., BEVAN, E. J. AND SINDALL, R. W.: **Wood Pulp.** New ed. London: Constable & Co.

U. S., 1,151,490, Aug. 24. W. A. R. M. MCRAE. **Half-stuff, paper-pulp or paper** is made from bagasse by crushing, boiling with live steam and milk of lime, allowing the cooked material to mellow, washing and agitating to remove the pithy and mucilaginous substances and other impurities and disintegrating the material after sepn. from the excess of wash H_2O.

Brit., 9,266, Apr. 14, 1914. VEREIN FÜR CHEM. IND. **Cellulose acetates, which** are infusible, are prepd. by acetylating cellulose from which every trace of H_2O has been removed. The dehydration is effected by allowing a mixt. of cellulose, Ac_2O, and glacial HOAc or other diluent, to stand for several days, or by heating such a mixt. to 100° or less for some hrs. The catalyst necessary for acetylation is then added, *e. g.*, in admixt. with Ac_2O.

Brit., 9,270, Apr. 14, 1914. BADISCHE. **Products resembling celluloid are manufd.** from cellulose derivs., such as nitro- or acetylcellulose, and acyl derivs. of a completely hydrogenized aromatic base, such as acetyldicyclohexyl amine obtained by acetylating dicyclohexyl amine, or dicyclohexyltoluenesulfonamide obtained from dicyclohexyl amine by the action of *p*-toluenesulfonyl chloride. In an example, 35 parts of acetyldicyclohexyl amine are mixed with 82 parts of nitrocellulose together with a little alc., and the mixt. is worked up.

Brit., 10,605, Apr. 29, 1914. R. WILLSTÄTTER. **Cellulose solutions.** See Ger. 273,800 (*C. A.* 8, 2948).

Can., 163,400, June 22, 1915. C. MARCHAND. **The process of recovering by-products from the residue of wood sulfite plants** by "detoxicating the residue," expelling SO_2, neutralizing the remaining acids with an alkali, pptg. and decanting, fermenting the decanted liquor, distg. the alc., mixing with the residue comminuted fuel, evapg. the mixt., pressing into briquets and drying.

24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

Thirty-ninth annual report of His Majesty's Inspectors of Explosives. A. COOPER-KEY, *et al.* *Home Office Repts. Ann. Rept.* 1914, 137 pp.—This report is filled with valuable statistical matter and records of tests and occurrences. The supplies of K salts having been cut off by the war, the definition of "gun powder, ordinarily so called" has been revized to include $NaNO_3$ in its compn. Since powder containing $NaNO_3$ is in this country called "blasting powder" it is important to note this difference in practice. The chemical advizers, F. H. and P. V. DUPRE, report as follows: The only work of general interest carried out during the year was a lengthy investigation into the effect of the addition of diphenylamine on the stability of nitrocellulose powders. The tests mainly used were the vapor tension test, described in former annual reports,

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and the new small vessel test as described to the Heat Test Committee, with some modification. The conclusion was as follows: (1) That diphenylamine has a very appreciable action on nitrocellulose above 100°, becoming nitrated itself at the expense of the N in the nitrocellulose, thus increasing the normal rate of decompn. This action was also noticeable at ordinary temps. (2) This action increases with an increase in the proportion of diphenylamine. The amt. of decompn. products given off at 125° F. by a nitrocellulose powder containing 6% of diphenylamine is higher than that given off by the powder without addition, notwithstanding the fact that a large amt. is fixed by the diphenylamine. The decompn. suffered by the nitrocellulose is, therefore, considerably greater than that which would have occurred had no diphenylamine been present. (3) The affinity of the diphenylamine for HNO_2 is, however, so great that no free acid products can be formed, and consequently no acceleration in the decompn. produced, even when the powder is kept at high temps. under very drastic conditions. For instance, the powder containing 6% of diphenylamine was kept for 170 hrs. at 100°, and then gave only a slightly increased rate of decompn. when tested by the vapor tension test. That considerable decompn. took place was shown by the intense blackening of the diphenylamine, also by the increased solubility of the nitrocellulose, but the powder showed no tendency to break down even after such severe treatment. The increase in safety is very strikingly shown by the fact that powder, without addition, which gave extraordinarily good storage trials, showing no signs of deterioration after 18 weeks at 110° F. (explosives for authorization are only required to stand six weeks at 90° F.), fumed off after 17 hrs. at 100° C. There is, therefore, no doubt that the safety of this powder is very much increased by the addition of diphenylamine until the diphenylamine is satd., and also that this satn. would take an extremely long time (no doubt many years under adverse conditions of storage). At the same time the normal rate of decompn. of nitrocellulose is increased, and it is quite possible that after prolonged storage a powder containing diphenylamine may have a lower N content than the powder without such addition. Tentative limits have been laid down for this class of powder, and when, by means of a number of samples, these can be definitely fixed, they will be published in a future annual report. The Messrs. Dupre have frequently been accused of condemning explosives because they contained ingredients (so-called stabilizers) which interfere with the heat test; hence they take this opportunity of pointing out that this has only been done in cases where such an addition lengthened the test without improving the stability of the powder. This is the first occasion on which an addition has been proposed which, while it interferes with the rate of the heat test, at the same time really improves the keeping qualities of the powder, and they sanctioned the addition, although it makes the heat test of practically no value. Although they have perfect confidence in the results given by the heat tests, and although this confidence is strengthened rather than diminished by further investigations, they have never allowed it to prevent additions which really improve the keeping qualities of powders, and thus make for safety in storage. The impression, which appears to be widespread, that they have allowed their test to interfere with the progress of the explosive industry has arisen only because ingredients have been called stabilizers which have no stabilizing action at all, having, on the contrary, in some instances a definite deteriorating action on the powder to which they are added. If an ingredient were suggested which they were satisfied was a real stabilizer and if the addition of this ingredient made all existing tests of no value, there would necessarily be some delay in the authorization of the ingredient while investigating methods for controlling the manuf. of explosives with such addition, but the delay would be on this account and not because it interfered with the heat test. It may be of interest to point out that, although it has been suggested more than once that they are disposed to be ultra-conservative in their dependence on the heat test, when a circular

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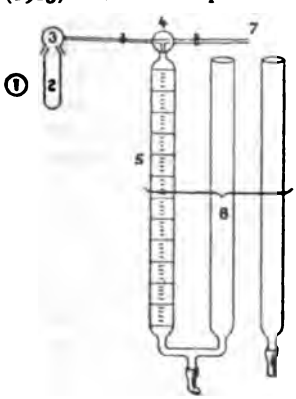
letter was sent out on behalf of the Heat Test Committee to all manufacturers and explosives chemists in Great Britain, as well as to firms importing explosives into this country, asking for suggestions for alternative tests for investigation, not a single test was put forward. The heat test may not be infallible, but a more reliable substitute does not yet appear to have been found. CHARLES E. MUNROE.

Permissible explosives. SPENCER P. HOWELL. Dept. of Intern., Bur. of Mines, *Tech. Paper* **100**, 16 pp.(1915).—This is a statement of the conditions existing Mar. 1, 1915. On Jan. 1, 1914, there were 116 explosives on the Permissible List. During the succeeding 14 months 19 were added and 6 dropped, leaving 129. These embraced representatives of the NH_4NO_3, hydrated, organic nitrate and nitroglycerin explosives so that the user may choose from among many varieties and from a considerable number of different manufacturers. The unit deflective charge, which many regard as representing the "coal-getting" strength of permissible explosives, and rate of detonation are given for each explosive on the list. CHARLES E. MUNROE.

Trinitrotoluene. ANON. *Engineering* **100**, 122(1915).—Characteristics and behavior in use in war are noted and instances of explosion while being compressed in shells, notwithstanding its general insensitiveness, are cited. CHARLES E. MUNROE.

Apparatus for the photolysis of powder. GUILBAND. *Compt. rend.* **161**, 212–3 (1915).—The decompn. tube is of transparent quartz, 15 mm. diam. and 100 mm. high. 1 (see fig.) is a Hg vapor lamp; 2, decompn. tube; 3, ground glass hood; 4, 3-way stopcock; 5, measuring buret; 6, whole measuring app.; 7, connection to vacuum pump and absorption app. *Method:* Place 2 to 2.5 g. of nitrocellulose or powder in the decompn. tube, place hood in position and evacuate (to about 20 mm.). In practice the vol. of residual air is neglected. The decompn. tube, connected by the 3-way cock with the buret, is exposed to the rays of a Hg vapor lamp for a definite time, noting from time to time the vol. of gas, from which data a curve showing rate of decompn. is plotted. At the end of the period fixed for the test, close stopcock connection to decompn. tube and connect with app. for examining the gases. Cf. Berthelot and Gaudechon, *C. A.* **5**, 3412; **6**, 804, 1225, 2530; **9**, 2184. F. W. SMITHER.



Occurrence of explosive gases in coal mines. N. H. DARTON. Dept. Int., Bur. Mines, *Bull.* **72**, 232 pp.(1915).—This report presents the results of an investigation begun in 1907 and continued in field and lab. for some 7 years. The purpose of the investigation was to obtain information on the origin of the inflammable gases in coal and the conditions under which they occur. It was especially intended to ascertain whether there is any relation between the occurrence of gas and the structural or other geologic features of the coal beds. To this end many months were spent in mines and much time was devoted to the exam. of mine maps, bore hole records, and other data made available by the kindness of various coal companies. Two fields of work were selected, one in the northern anthracite basin of Pennsylvania, where the beds are considerably flexed, and the other in the southern part of the bituminous coal field of Illinois, where the beds lie nearly horizontal. In order to take advantage of results of previous investigations of the same general subject, an extended exam. was made of reports of various investigators in Europe and America. A digest of the information obtained from these publications is included in the first part of the report, which constitutes an introduction to the discussion of the conditions governing the occurrence of inflammable gas in coal beds. The analysis of extended data on mine explosions

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leads to the conclusion that the human factor is the controlling cause in most accidents. The results of the analysis of a large number of mine atmospheres are recorded.

CHARLES E. MUNROE.

Explosion from a defective gas service governor. REINHARD. *J. Gasbel.* Jan. 30, 1915; *J. Ind. Eng. Chem.* 7, 439–40(1915).—A Hahn governor having 1½ inch connections was attached to the outlet of a 50 light meter and on the night of the explosion evidently an undue pressure blew the gas through the governor and permitted an explosive mixt. to be formed in the cellar. This is precisely what occurred at the U. S. Capitol when, in 1898, the U. S. Supreme Court section was seriously damaged by a gas explosion due to the escape of gas through a glycerol governor (see Rept. on explosion at U. S. Capitol, Charles E. Munroe. *Ann. Rept. Arch. of U. S. Capitol* 1899, pp. 29–44). R. describes a recent type which minimizes the defect in these governors.

CHARLES E. MUNROE.

The efficiency of tamping. EDGAR A. COLLINS. *Min. Sci. Press.* 110, 790(1915). —Following the advice given in Bur. of Mines *Tech. Paper* No. 17 tests have been made in practice on the relative efficiency of charges of explosives with increasing depth of tamped stemming, above the charges used, with the result that with 30% ammonia gelatin being used in the mine where the test was made, an apparent saving in practice of 25% in quantity of the explosive was effected. Hence the amount of explosive now issued to the miners for use is cut to from 10 to 20% of that formerly issued. The writer of the article has completely reversed the meaning of the terms "tamping" and "stemming" when quoting from the Bureau of Mines publication. C. E. M.

Technical reminiscences. E. GYBBON SPILSBURY. *Mining Sci. Press* 3, 40–2 (1915).—A discussion of the origin and meaning of the terms "tamping" and "stemming."

CHARLES E. MUNROE.

ESCALES, R.: **Die Explosivstoffe mit besonderer Berücksichtigung der neueren Patente.** 6 Heft. Nitrosprengstoffe. Leipzig: Veit & Co. 448 ss. 15 M.

Brit., 11,721, May 12, 1914. SCHOELLER & Co. App. for **detecting the presence of injurious gases in mines,** etc., with the aid of a diaphragm.

Can., 164,009, July 27, 1915. ED. MACCAULEY. **Method of neutralizing or annuling the noxious gases consequent on the combustion of nitroglycerin explosives** by incorporating in the tamping for drill holes charged with such explosives a compn. of NH_4Cl, CaO and $KMnO_4$.

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25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Principles for the preparation of a rational color-atlas. W. OSTWALD. *Z. angew. Chem.* 28, I, 182–3(1915).—The projected atlas shall consist of a collection of all the colors to be defined in the form of dull coatings on paper. The prep. of the same system of colors as pigments ready for use, especially in the form of pastel-crayons and dull oil-colors, would be a desirable later development. The scheme of the atlas shall be based wholly on the rule of color perceptions, *i. e.*, the basis shall be psychophysical. Physical definitions, such as wave-lengths, shall be considered secondary aids. Since color perceptions are a 3-fold composite, the arrangement and designation of colors in the atlas shall be characterized by norms in each of these 3 properties, *viz.*, brightness ("Helligkeit"), shade ("Farbton") and purity ("Reinheit"). Conversely, the giving of the values of these 3 elements shall constitute a univocal and exhaustive definition

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for each color. Every color, whether gray or lively, has a definite brightness which lies between the whitest white and blackest black. As norms of brightness, a series of graded grays shall be prepared by shading a pure white. The graduations shall follow Fechner's law (geometric ratios in the amts. of light reflected by successive members of the series). The blackest pigment as a dull black smear has been found by O. to reflect $^1/_{10}$ of the light reflected by the whitest pigment ($BaSO_4$). Between these a series of 24 easily distinguishable mixts. can be prepared. O. has devized an app. for constructing and keeping constant the members of the series independently of individual and local influences. By the addition of purple-violet and violet-red shades to the natural spectrum a continuous color circle is obtained, the complementary colors which give white or neutral gray, when mixed, lying opposite to each other. This circle should be divided preliminarily into 24 steps. The definition and prepn. of these is a problem for the future which should be capable of soln. on the basis of combinations of 3 colors, which are colorless when mixed. The purity is measured by the fraction of the pure shade to the whole which comprizes also white, black or gray. The exact detn. of this quantity is still unsolved. It is possible that 10 or 12 members would constitute a satisfactory series. The total number of colors in the system would be 6000 (25 × 24 × 10) if the different norms could be combined in all possible permutations. In practice it would be necessary to limit the number to about 3000. By assigning a letter to each member of each series of norms, and observing a fixed order (brightness, shade and purity) each color could be concisely defined. W. F. F.

Natural versus synthetic indigo. J. P. Srivastava and W. Cole. *J. Soc. Dyers Colourists* 31, 100–2(1915).—Bergtheil and Briggs (*Ibid* 23, 146) stated that natural indigo dyes a deeper shade than synthetic indigo. According to the Badische Co. the brand of synthetic indigo used was not suited for wool dyeing in a hydrosulfite vat. Pastes of Bengal indigo of fine quality and of synthetic indigo were analyzed and a number of indigotin units agreed upon for each sample. Upon this basis they gave dyeings which were practically identical and could not be readily distinguished from each other. The synthetic indigo appeared to give a shade with greater bloom and require less hydrosulfite than the natural product. L. A. Olney.

A new method of valuing hydrosulfites. Edmund Knecht. *J. Soc. Dyers Colourists* 31, 94–6(1915).—The first quant. methods of estg. Na hydrosulfite were due to Schützenberger and depended upon the decolorizing action which it exerts on an ammoniacal soln. of $CuSO_4$. Ekker's method depends upon reduction of a neutral or slightly acid soln. of $K_3Fe(CN)_6$, Mohr's method upon reduction of $Fe_2(SO_4)_3$ and Sinnatt's method upon oxidation of hydrosulfite with H_2O_2 to H_2SO_4. In the method of Knecht and Hibbert methylene blue is reduced to its colorless leuco compd. Seyewetz and Bloch's method is based upon the reducing action of hydrosulfite upon an ammoniacal soln. of AgCl. The new method consists in quantitatively oxidizing hydrosulfites to sulfites by alk. solns. of chromates according to the following reaction: $2\ Na_2CrO_4 + 3\ Na_2S_2O_4 + 2\ NaOH = 6\ Na_2SO_3 + Cr_2O_3 + H_2O$. The bright green ppt. of Cr_2O_3 is easily sepd. from the excess of chromate. The pptd. Cr_2O_3 is boiled with water and Na_2O_2 until it is converted into chromate and dissolved, and the excess of peroxide destroyed. The soln. is then acidified with H_2SO_4 and the Cr estd. by adding an excess of standardized titanous chloride and titrating back with iron alum or ferrous sulfate. L. A. Olney.

Fastness of direct coppered blues. Alfred Edge. *J. Soc. Dyers Colourists* 31, 75–6(1915).—The value of an after-treatment where the object is to obtain additional fastness to both washing and light is considerably reduced if the effect is wholly or partly destroyed by the action of soap and soda. A number of expts. were performed to ascertain the effects of a domestic wash on fastness to light of after-treated dyeings

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by washing 10 min. at 130° F. in a soln. of 4 g. Marseilles soap and 4 g. soda crystals per l. The results show that in most cases the effect is slight, but the result of washing was most marked in the case of direct blues that had been after-treated with $CuSO_4$. In many instances the shade is turned greener and in other cases it is reddened. Acetic acid partially restores the original shade but the fastness to light is found to be considerably impaired. It was found that the injurious effect of an olein finish on "coppered blues" is obviated if dextrin is also present. L. A. OLNEY.

Investigation of Turkey red oils according to Dr. Herbig. WELWART. Vienna. *Färber-Ztg.* **26**, 132–3(1915); cf. *C. A.* **8**, 2809; **9**, 1851.—Polemical. W. F. F.

The acetone method of analysis for Turkey red oils. W. HERBIG. Chemnitz. *Färber-Ztg.* **26**, 148–9(1915).—Reply (cf. preceding abstr.). W. F. FARAGHER.

Apparatus-dyeing with vat-dyes. WILHELM MÜNSTER. *Färber-Ztg.* **26**, 141–2 (1915).—Cops and similar forms can be dyed successfully only in clear solns. There are 2 general methods for bringing the vat-dyes into soln. The dye may be added to the bath in the form of its leuco compd. or the reducing agent may be present with the dissolving agent, *e. g.*, NaOH. In the second method, a strong stock soln. of reduced, dissolved dye is prepared. Examples of both methods are given, some dyes being most suitably worked by the one and others by the other method. W. F. F.

The new uniform-materials for the summer regimentals. AUG. AXMACHER. *Färber-Ztg.* **26**, 125–7(1915).—The government's specifications for field-gray cotton for coats and blue-gray for trousers allow three dyeing methods: piece-dyeing, hank-dyeing or loose-cotton-dyeing. The fabric must be free from sizing and weighting materials. The raw fabric is napped on the back, the trouser-material being given more of a nap than the other. The cloth is then sheared and singed on the right side. Unless cotton-wool free from shells has been used, the fabric must be treated with a hot soln. of NaOH in the jigger. Either vat-dyes or sulfur dyes are permissible; since the latter are the cheaper and are more easily applied, they are most generally used. In order to assure good penetration and prevent unlevel dyeing, the fabric is first run through a boiling soln. which contains 2 g. Na_2CO_3, 1 g. Monopole soap or sol. oil and 4 g. Na_2S per l. Half of the dye soln. is then added, and after one passage the remainder. When the bath is sufficiently exhausted, the goods are squeezed, and then rinsed in prepn. for the after-treatment. The latter consists in two passages at 70° in the jigger which contains the following soln.: 1 % $K_2Cr_2O_7$, 0.5% $CuSO_4$ and 1.5% $HC_2H_3O_2$ of 30% strength or 0.3% HCOOH of 85% strength. Washing and drying on a calendar follow. The dry material is then water-proofed, so that the material for coats is impervious to water during 24 hrs. at a pressure of $7^1/_2$ cm. and that for trousers at a pressure of 12 cm. The impregnating is done on a padding machine or other suitable app. A cold 6° Bé. soln. of basic Al acetate or formate is used first. The fabric is then dried quickly at a higher temp. The second bath is an emulsion which contains 20–40 g. soap, 2 g. Na_2CO_3 and 10 g. paraffin per l. This bath is heated by indirect heating coils to a temp. of 50° and must be stirred mechanically. The basic Al acetate is prepared as follows: Dissolve 1000 parts (all by wt.) of Al sulfate in 5000 parts of H_2O and allow to cool. Add slowly 150 parts of Na_2CO_3 dissolved in 500 parts of water. A soln. of 500 parts Ca acetate in 2000 parts of water is added, the mixt. stirred for $^1/_2$ hr. and then allowed to settle. The clear supernatant liquid is then drawn off, and diluted for use. The use of Al sulfate or alum is forbidden, both from sanitary considerations and from the fact that during drying H_2SO_4 may be liberated with consequent weakening of the fibers. Olive oil soap or preferably a grained tallow soap is used. The goods are finished by calendering or more desirably by lightly pressing. Directions for testing the fastness of the dyeings are not included, although they are given in the government's specifications. W. F. FARAGHER.

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FAY, I. W.: **The Chemistry of the Coal-Tar Dyes.** New York: D. Van Nostrand Co. 473 pp. $4.00.

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Brit., 12,055, May 15, 1914. CHEM. FABRIK GRIESHEIM-ELEKTRON. Anthraquinone is prepd. by treating anthracene with HNO_3 at a temp. below 60° in the presence of a solvent or diluent, and then transforming the intermediate product into anthraquinone by means of HNO_3 or other oxidizing agent at a higher temp. Addition of salts of Hg in the first or second stage improves the yield obtained.

Brit., 12,091, May 15, 1914. BAYER & CO. **Dihydroxycarbonylbenzenesulfonyl chlorides** and their derivs. are prepd. by nitrating the products described in 15,430, 1913 (C. A. 9, 385).

Brit., 12,080, May 20, 1914. F. FERRARI. **Protecting cellulose in textile fibers and fabrics** from degradation in subsequent processes, such as boiling, chemicking, and bleaching, by subjecting the textiles to a preliminary treatment with a mixt. of $HClO$ and a sulfonated wax, fat, or oil. Thus, cotton cloth may be steeped in a bath of an aq. soln. or mixt. of $HClO$ and sulfonated mineral oil. Or the liquid may be forced through the materials, e. g., when wound on perforated bobbins. The materials treated, besides showing no loss in wt. in subsequent treatments, take faster and brighter shades in finishing, dyeing, and printing processes. When loose cotton is to be used in the manuf. of gun-cotton it is so treated, it is found to take a higher degree of nitration.

Brit., 12,125, May 20, 1914. W. GREAVES. In a retting process for the treatment of flax and other fibrous plants for the production of textile fibers by removing the resinous, gummy and pectose constituents, flax straw is soaked or scoured at a temp. below boiling or about 4 hrs. in an alk. soln. containing a spirit, which may consist mainly of an alc. A soap soln. containing free alkali and spirit may be used. The free alkali serves to soften and counteract the hardness of the H_2O. The liquor is then drained off, and the material is rinsed in soft H_2O, passed through rollers to remove the greater part of the moisture, sprayed with H_2O from a great height to remove soft and other loose matter, and then washed and scoured in H_2O containing a curd, [illegible] or superfatted soap. After washing with H_2O, the material may be passed again through rollers and finally dried, combed, and carded, waste matter being removed by blowing during carding or combing. The material is treated in a kier having a false bottom, a perforated side and a removable lid, and may be packed in [illegible]. To reduce the consumption of alkali and [illegible] the kier may be provided with a tube or other app. and a pump may be used to circulate the liquor from the kier bottom through the perforated side of the kier. Soluble constituents may be [illegible] from the waste liquor containing soap by filtering, settling or other means, and the solids and liquids so [illegible] be used as fertilizers or for growing moulds. The spirit may be [illegible] by mixing the spirituous liquor with concentrated aq. solns. of NaOH and making up [illegible]. The mixt. is allowed to stand, when water or about 12 hrs.

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and then boiled for half an hr. The soap so obtained is put into frames, and 16% of spirit, such as wood spirit, potato spirit, or terebene, added and thoroughly mixed by stirring. The soap is allowed to cool and then cut into bars.

Ger., 282,711, Jan. 30, 1913. M. KARDOS. New **anthracene derivatives** are obtained by the action of acids on the monoöximes resulting from the action of NH_2OH, or substances that yield NH_2OH, on anthraquinone or its halogen substitution products. The properties of the products indicate that they are anthracene-1,9-dicarboxylic acid imide, or its decomp. products, *i. e.*, monoamides of the anthracene-1,9-dicarboxylic acids or their anhydrides. According to the course of the reaction, more or less of the one or the other compd. is obtained. They are valuable initial materials for the manuf. of dyes. Cf. *C. A.* 8, 1847.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

The constitution of ultramarine. P. ROHLAND. Stuttgart. *Kolloid-Z.* 16, 145–6(1915).—R. traces the different theories regarding the structure of ultramarine and finally comes to the conclusion that it is a colloidal adsorption compd. between silicates, as kaolin or clay, and S or S compds. H. I. MATTILL.

The metallic content of some linoleates and rosinates. L. G. RADCLIFFE AND C. W. PALMER. *J. Soc. Chem. Ind.* 34, 644–5(1915).—Description of com. linoleates and rosinates is given. These substances are chiefly used to accelerate the drying of paint and varnish products. R. and P. recommend that such materials be valued according to the metallic content. Tables are given showing the amts. of metal present in com. linoleates and rosinates of Zn, Ca, Cu, Mg, Mn, Pb, Al and Co, and the loss at 100–104°. From specially prepd. abietic acid R. and P. prepd. rosinates of Pb, Mn and Co, which showed metallic contents very close to the theoretical for $(C_{19}H_{29}O_2)_2$:M. E. W. BOUGHTON.

Linseed oil drying. F. FRITZ. Triest, Austria. *Chem. Rev. Fett-Harz-Ind.* 22, 60–1(1915); cf. *C. A.* 9, 1397.—F. reinvestigated the question: is oxidation hastened in an acid, neutral or alkaline oil? (cf. Hertkorn, *Chem. Ztg.* 27, 856(1903); *C. A.* 4, 2743.) He finds that addition of 2% linolic acid to a linseed oil drier retards drying a little; a 2% addition of a strongly alkaline soft soap behaved like the linolic acid; a linseed oil paint contg. a drier and also lime (from marble), dried considerably sooner than the normal, and a linseed oil without any drier but contg. 5% hydrated lime was easily converted into solid linoxyn at about 50° and const. stirring, showing at the finish 30.3% non-oxidized acids. P. ESCHER.

The soluble artificial resins and their applicability. H. KÜHL. *Kunststoffe* 5, 196–7(1915).—A discussion of the prepn. of casein-cresol spirit lacquers, phenol-formaldehyde condensation products, etc. K. reports expts. on coating linden and fir woods with a patented spirit lacquer (1 part of artificial resin to 3 parts of spirits), and with Bakelite varnish, showing no difference between the films obtained after applying 2 coats and heating 6 hrs. at 60–65° after drying. Expts. are also reported showing the preservative and antiseptic properties of artificial resins. The lacquer film is quite indifferent to atm. influences. The resistance to chem. agents depends upon the compn. of the film. Lacquered wood panels were less sensitive than lacquered metal plates, probably due to the penetration and the acceleration of the subsequent hardening of the film by the wood substance. The elasticity of the films was tested by coating leather and bending. The darkening of films from phenol-formaldehyde condensation products and other artificial resins may limit their technical applicability. F. W. SMITHER.

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Important resin solvents. O. HILWITZ. *Seifensieder-Ztg.* 42, 625–6(1915).—Acetylene tetrachloride (b. 145°, noninflammable) is a good solvent for sandarac, mastic and copal and gives clear solns. It is also a good solvent for acetylized cellulose esters (used for waterproofing). Lacquers prepd. with acetylene tetrachloride have a high gloss, spread well, do not streak and are durable. For volatile lacquers mono- and dichlorobenzene are suitable as both mix in all proportions with drying oils and turpentine. Damar resin is not sol. in dichlorobenzene, while shellac, sandarac, yellow akaroid resin, unmelted Manila copal and West African copals are insol. in both these solvents except when alc. is added. Chlorohydrin dissolves resins which are insol. in the ordinary solvents. An excellent lacquer is made by allowing 1 part kauri copal and 1 part dichlorohydrin to stand, and then adding 1 part alc. and warming, after which 10 to 15% of castor or linseed oil is added. CCl_4 dissolves completely only Brazil copal, but others can be made sol. by the addition of abs. alc. Methyl ethyl ketone dissolves Brazil, sandarac and kauri copal completely and mastic to a great extent. Of all solvents, terpineol is the best, but so far it has been found impracticable to manuf. a usable lacquer with it. E. SCHERUBEL.

Utilization of the formic and acetic acids produced by the oxidation of linseed oil. F. FRITZ. *Z. angew. Chem.* 28, I, 272(1915).—During the drying of linseed oil HCOOH and AcOH are evolved, the amt. of the two being about 5% of the weight of the oil. In linoleum factories these acids have an injurious, corrosive effect on the inside of the buildings. F. proposes to pass the vapors from the drying oil through $Ca(OH)_2$, NaOH or Na_2CO_3, the acids being subsequently recovered. The CO_2 evolved may be utilized to form basic Pb carbonate in the linoleum by its action on the Pb present, the latter having been added as drier in the form of PbO or Pb_3O_4. E. W. B.

ANDRES, E.: **Die Fabrikation der Lacke, Firnisse, u. s. w.** 6 Aufl. Wien. 270 ss. 3 M.

CRAVIRE, C.: **Le conifere da rimboschimento e l'industria resiniera.** Milan. 322 pp. 4 L.

SEELIGMANN, F. AND ZICKE, E.: **Handbuch der Lack- und Firnis-Industrie.** Berlin: Union Deutsche Verlagsgesellschaft. 1074 ss. 30 M.

STOCK, E.: **Die Fabrikation die Oellacke und Siccative.** Wien. 6 M.

Brit., 12,188, May 18, 1914. W. H. KEMP. **A waterproof paint** consists of French chalk, plaster of Paris, litharge, powdered resin, portland cement, white sand, and Zn white mixed to a thick paste with a mixt. of rubber soln., knotting or spirit varnish, boiled linseed oil, turpentine, and driers. A pigment such as ultramarine, chrome yellow, or brown umber, ground in turpentine, linseed oil, or gold size, may be added. If a glossy surface is required, varnish is added.

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27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

Hydrogenated oils. ANDREW CAMPBELL. *J. Am. Pharm. Assoc.* 4, 675–6(1915).—A review of the methods employed. M. I. W.

Hydrogenation of unsaturated fatty acids and their glycerides with nickel borate as catalyzer. H. SCHONFELD. *Seifensieder-Ztg.* 42, 553–4, 577(1915).—Polemical against Erdmann and Rack (*C. A.* 9, 1255). E. SCHERUBEL.

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Cottonseed oil and cottonseed stearin. G. KNIGGE. *Seifenfabrikant* 35, 657 (1915).—A discussion of analyses. E. SCHERUBEL.

Native (German) plants as sources of oils and fats. U. DAMMER. *Seifenfabrikant* 35, 674(1915).—It is estd. that 2 million kg. of oil can be obtained from cherry seeds in Germany per annum and 9.5 million kg. from plum seeds. Besides these sources a plentiful supply can be obtained from cucumber, sunflower and various other seeds. It is suggested that all oil contg. seeds be delivered to a central collecting place and that soap mfrs. undertake the recovery of the oils. E. SCHERUBEL.

Utilization of the seeds of Marytynia Louisiana (unicorn or devil's claws). E. H. S. BAILEY AND W. S. LONG. *Oil, Paint and Drug Rep.* 88, No. 1, 17(1915).—The plant, a common weed, grows in Kan., Cal., Texas and N. M. It flourishes in a dry climate. Analysis of the seeds showed: Et_2O ext. 60.80, protein 23.19, starch 4.36, moisture 3.66, crude fiber 1.51, ash 3.68, undetd. 2.60%. The consts. of the oil were as follows: $d_{15.5}$ 0.9157, n 1.4767, sapon. no. 198, I no. 122.5. The oil is similar to olive oil and mustard oil, and may be utilized in the future as an edible oil. E. W. B.

The recovery of Ghedda (bee's) wax and the wax from the viking ship of Oseberg. H. FISCHER. *Z. angew. Chem.* 28, I, 303–4(1915).—F. refers to an article by Sibelius regarding the comp. of a wax obtained from a viking ship, in which S. expresses a desire to study more closely the methods of recovering wax in the East Indies. F. describes the methods of recovering and refining the wax and honey in the various districts of India. The waxes vary in color from a greenish gray, light green to a gray color, and are given a yellow color by the addition of turmeric. In spite of S.'s observations that some forms of remelting produce a reduction of acid no., F. does not believe that the reduction of the acid no. of European waxes (18–20) to that of the India waxes (6–9) is due to remelting. It is possible to produce from the European and Indian waxes a wax corresponding to that obtained from the viking ship and having the following characteristics: acid no., 16.6; ester no., 78.74; sapon. no., 95.30; ratio no., 4.74. H. R. GUNDLACH.

Recovery of paraffin from bleaching earth. P. M. GREMPE. *Seifenfabrikant* 35, 7345(1915).—About 30 to 40% paraffin is retained in bleaching earths. This is now being recovered by extn. E. SCHERUBEL.

Shaving soap. B. ZIENLE. *Seifensieder-Ztg.* 42, 511–2(1915).—A discussion of the method of manuf. E. SCHERUBEL.

Fat and oil industry in France. K. LOFFL. *Seifensieder-Ztg.* 42, 551–2(1915).—Discussion of raw materials for soap and margarine industry. E. SCHERUBEL.

Bone grease. G. KNIGGE. *Seifenfabrikant* 35, 694–5(1915).—A discussion of the prepn. of this material for use in soap manuf. E. SCHERUBEL.

Substitute for sulfuric acid in the soap and fat industry. G. *Seifenfabrikant* 35, 713–14(1915).—Owing to the war H_2SO_4 is becoming scarce and it is suggested that besides using HCl it is also possible to use $NaHSO_4$. An advantage in the use of the latter is the fact that it can be easily handled on account of its solid form. E. SCHERUBEL.

Corean beeswax. SEIICHI UENO. *Analyst* 40, 343–4(1915).—Corean beeswax is secreted by the bee *Apis indica*, similar to the Japanese bee. Four samples were examd. with the following av. results: d_4^{100} 0.8229, m. p. 65.6°, n, detd. at 85°, calcd. to 40°, 1.4580, butyro-refractometer, detd. 85°, calcd. 40°, 48.0, acid value 5.85, sapon. value 84.56, ester value 78.71, ratio no. 13.45, I value (Wijs) 11.41. Acid and sapon. values were detd. by the modified method of Bohrish and Kürscher (*Pharm. Zentr.* 1910, No. 25/20). The results show a resemblance to Japanese beeswax. They are also similar to Indian beeswax secreted by *A. florea*, L., *A. dorsata*, L., and *A.*

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indica, L., but differ markedly from European and American beeswax secreted by *A. mellifica*, L. P. B. DUNBAR.

Separation of wax from straw (HEUSER) 23. Rosin solvents (HILWITZ) 26. Preservative for preparations evolving oxygen (KIND) 18.

LEZÉ, R.: **Utilisation des débris des animaux et déchets de la boucherie.** 2é ed. Paris: Chas. Amat. 297 pp.

Can., 163,984, July 27, 1915. C. ELLIS. **Hydrogenating fats** by exposing in liquid condition, and in the presence of a catalyzer, to a bubbling current of H, the general direction of the movement of the body of the mixt. being across the path of travel of the H current. Cf. *C. A.* 8, 1356.

28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

History of sugar cane. C. W. HINES. *Sugar* 17, No. 8, 27–9(1915).—A short reference to the history of sugar cane with a review of the sugar cane industry of the Philippines. A. GROSS.

Determination of sucrose in molasses by means of invertase. H. PELLET. *Intern. Sugar J.* 17, 367–9(1915).—P. does not agree with E. Saillard that alc. fermentation takes place when using the method of J. P. Ogilvie for the detn. of sucrose by the double polarization method. No alc. fermentation was noted by the use of English top fermentation yeast at the rate of 3 g. per 50 cc. of sugar soln. even when the mixt. was set aside for some time before raising it to 55°. P. assumes that S. did not follow the directions of the method by previously heating the liquid to 55° before adding the yeast. A. GROSS.

The reduction of cupric salts by sugars. WILLIAM CRAMER. *Proc. Chem. Soc.* 30, 293(1914).—The reduction of cupric salts by sugars in alk. soln. proceeds readily as far as metallic copper. The formation of Cu_2O, which is usually regarded as the end point of the reaction, is only an intermediate stage at which the reaction may be stopped by using an excess of the cupric salt. R. L. SIBLEY.

The latest prescribed rules for chemical control in the cane sugar factories in Java. H. C. PRINSEN-GEERLIGS. *Louisiana Planter* 55, 156–7(1915).—The cane is weighed at its entrance into the factory yard on wagons or trucks on a weighing bridge. The wt. of the empty cars is established after they are emptied. The liquids used for maceration, especially last mill juice, are by preference weighed on automatic weighing machines. When using cold H_2O for maceration, it may be measured in tanks which are filled and emptied alternately. The wt. of the bagasse is found by subtracting the wt. of the raw juice from the sum of the wts. of the cane and maceration and sweet H_2O, in case the latter has been used. For the investigation of the mill work a big sample of bagasse from the first mills is taken every hr. over the full width of the carrier after having shut off the maceration H_2O over the spot where the sample is being taken. If the maceration pipe keeps leaking the H_2O flowing out is caught by a small gutter. For the chem. control a big sample from the last mill is taken by sampling the bagasse coming out uninterruptedly during $^1/_4$ hr., starting every quarter before the full hr. The pieces of bagasse will vary in size due to uneven crushing and lack of uniformity of the blanket. When sampling the bagasse from more than one mill of the train, the big sample from the last mill should be taken first during $^1/_4$ hr., next that of the mill immediately preceding, and further, that of the one preceding the last

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mentioned, so that the stopping of the maceration H_2O due to the latter sampling will not affect the compn. of the bagasse from the last mill which is to give an insight into the losses of sucrose on extn. A. Gross.

A study in the chemical control of cane sugar factories. I. The effect of concentration on the determination of the "solids." Noël Deerr. *Intern. Sugar J.* 17, 360–3(1915).—A series of definitions, tables and formulas relating to the variation in "solids" with dilution of a raw cane sugar, cane sirup and molasses, as calc. from the observed "solids" at the stated diln. Not suitable for abstracting. A. Gross.

Reducing sugars in beet roots. H. Colin. *Bull. assoc. chim. sucr. ind.* 32, 156–8(1915).—It has been definitely established that beets do contain reducing sugars. C. shows that the amt. of reducing sugar is greatest during the first period of growth and is least at maturity, varying from 0.46 to 0.13%. H. R. Smith.

Decomposition of the reducing sugars (glucose) in cane juice during manufacture. H. C. Prinsen-Geerligs. *Louisiana Planter* 55, 10–1(1915).—The figures from 130 Java sugar factories showed a considerable decrease in the glucose, amounting to 12.3% of the total glucose in the raw juice where the juice had been clarified by the common defecation process, a decrease of 15% where the juice had been treated by the sulfitation process, while the av. loss of glucose working with the carbonatation process was 21.5%. The highest figure on record of the av. decrease of one single factory in one season amounted to 43.7% only between raw juice and sirup. A series of lab. expts. conducted by Van der Linden of the West Java Sugar Expt. Sta. is cited. These expts. duplicate the regular factory working processes. Starting with an artificial cane juice consisting of sucrose, pure invert sugar and $CaCl_2$, one series represented the common defecation method (using lime water), another the carbonatation methods, and another the sulfitation methods. With the common defecation method no glucose disappeared during the whole treatment as the ratio between sugar and Cl was exactly the same before and after treatment. With the sulfitation methods, the decrease in glucose content was not a strong one between raw juice and clarified juice. In no case was the decrease over 5% of the original amt. of the glucose. With the carbonatation methods, the results were the same in every case; those with the longest stay of the juice under the influence of the strongest alkalinity showed the biggest reduction in the glucose between raw juice and the clarified one. In contradistinction to the expts. with sulfitation no further decrease of the glucose could be detected between the stages of clarified juice and sirup, which shows very probably that the conversion of part of the glucose into resistant bodies without reducing power had taken place more thoroughly by carbonatation with a large amt. of lime than by sulfitation, in which process the amt. of lime is much less. As the expts. failed to explain the large factory losses, G. is of the opinion that in practical work, more lime is sometimes added than was done in the careful lab. expts., or higher temps. were maintained in juice heaters or in other parts of the machinery; also the analyses of cane molasses from defecated juices obtained from sugar factories reveal a not inconsiderable quantity of Ca salts of acids arizing from the decompn. of glucose. The expts. further showed that under the conditions no sucrose was broken up during any of the various clarification methods employed, a result which might not always occur in actual practice.
A. Gross.

Cane juice clarification. C. W. Hines. *Sugar* 17, No. 7, 36–9(1915).—A description of the reagents used for clarifying juices. A. Gross.

The value of lime as a sugar-factory germicide. W. L. Owen. *Sugar* 17, No. 7, 29–31(1915).—A series of tests was conducted to det. the relative germicidal efficiencies of $CaCl_2$, NH_4F, milk of lime, NaF, Na_2SO_3, and CH_2O. In view of costs only three out of the list can be profitably employed as sugar house germicides. These

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are CH_2O, milk of lime, and $CaCl_2$. CH_2O is an indispensable germicide for the sugar house not only as a preservative in emergencies but also for the suppression of unusually aggravated conditions of infection in the house. $CaCl_2$ is an excellent agent for the treatment of filter press cloth as its high germicidal value and its effectiveness upon the gum producing species of bacteria makes it well suited for this particular work. Milk of lime is for general purposes one of the very cheapest sugar-house germicides. The value of milk of lime was established by the expts., confirming the results found in actual practice. It is not only a good germicide but it is also an excellent cleaning agent; this makes it valuable for removing coatings of gums from the interior of tanks. There is a danger connected with the use of lime upon juices which have a tendency to undergo dextran fermentation, which is favored by a neutral or slightly alk. reaction. To avoid this condition, the application of SO_2 should follow the treatment with lime. By using this combination, the cleaning power of lime would tend to remove and destroy the sources of infection from the surroundings in which it is applied and the after-treatment with SO_2 would tend to retard the fermentation of the succeeding product. A. Gross.

Recent progress in cane sugar agriculture and the manufacture of cane sugar. W. E. Cross. *Rev. ind. agr. Tucuman; Sugar* **17**, No. 8, 39–40(1915).—A review of work done by various investigators on the causes for and the prevention of the deterioration of sugars due to bacteria and moisture. A. Gross.

To make white sugar from cane juice. E. U. Minckwitz. *Louisiana Planter* **55**, 108–9(1915).—Na_3PO_4 is used as the precipitant for the lime salts. The raw juice is heated and clarified by any of the clarification methods, run into a tank and after quickly heating to the b. p. a soln. of Na_3PO_4 is added to the clarified juice until all the lime salts are pptd. It is then sulfured and filtered and is ready for the evaporators. If the juice is heated correctly the SO_2 gas may be added after boiling the juice with Na_3PO_4. The SO_2 is not strong enough to decomp. the lime salts and therefore, can work directly as a decolorizing agent; one filtration may do at this stage of the work. The Na_3PO_4 can be made by treating clariphos with NaOH, the ppt. formed aiding in the filtration. In an expt. conducted by M., the Na_3PO_4 was added to the thin juice after the second carbonation and 3 lbs. of Na_3PO_4 were used to a ton of beets. After heating and filtering through Danek filters, no more lime salts could be detected. The color of the juice went from 22° to 100° Brix to 14° and the fillmass which usually gave from 27° to 30° color gave 17° color to 100° Brix; the yield test of sugar in the pan gave 5000 lbs. more of sugar to the pan than by the common process. A. G.

The making of sugar in Louisiana with special reference to white sugar. III. C. E. Coates. *Louisiana Planter* **55**, 157–9(1915); cf. *C. A.* **9**, 532.—C. does not believe that the diffusion process applied to cane extn. will be used again for some years. When shredded bagasse can be used for paper, diffusion has some advantages. Diffusion juice does not defecate as readily as mill juice when sulfitation is used as is the common practice in Louisiana and the West Indies. This does not apply so completely when carbonation is used. The main argument against diffusion is found in the improvement in milling during the last few years, especially since the introduction of grooving systems. An improvement is noted in the Messchaert grooving system as groove scrapers were necessary to clean the grooves which packed with bagasse. Instead of having the walls of the grooves at right angles to the surface, they are cut so that the groove is 1 in. wide at the top and $1^1/_2$ in. wide at the bottom, no scrapers being required as the flow of the juice keeps the grooves clean. During an extensive tour, C. found a number of centrals using the Java method of grinding cane now largely adopted in Cuba. The mill was run slowly and the feed made heavy so as to give a thick blanket under high pressure. The theory is that, if the mill runs fast, the ex-

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pressed juice is carried back to the bagasse before it has a chance to run down and be reabsorbed. In addition, a thick blanket absorbs saturation water better than a thin one. This method has given good results wherever tried and seemed to be favored by many of the best sugar engineers. Tests made last winter in Louisiana confirmed this result. A remarkable difference was found as to the proper amt. of saturation water to use. Tables are given representing the data of a number of houses in La., Cuba, Porto Rica and Hawaii, but owing to the lack of accurate figures and uniform methods, no definite conclusion could be reached. In general, the amt. of saturation water was found to depend on (1) the mechanical structure of a given mill which may det. its max. efficiency, (2) the % fiber in cane, a high fiber content requiring more saturation water and (3) the evapn. capacity of the house. A. GROSS.

Notes on the chemical characters of sugar canes cultivated at Sabour. C. S. TAYLOR. *Mem. Dept. Agr. India, Botan. Ser.* **2**, No. 2, 121.—T. notes that the groups made according to the chemical characters coincide with the botanical groups. Tables are given showing time of ripening, % sucrose and fiber. H. W. DAUDT.

Studies in Indian sugar canes. C. A. BARBER. *Mem. Dept. Agr. India, Botan. Ser.* **7**, No. 1.—The sucrose and invert-sugar contents of a number of varieties of Punjab canes are given for each month of the season (Nov. to Feb., inclusive). H. W. D.

Manufacture of maize sugar. G. DOBY. *Termeszettudomanyi Kozlony* **46**, 750–1; *Bull. Agr. Intelligence* **6**, 743(1915).—It has been shown that if the ears be removed from maize while in the milky stage a small amt. of glucose is formed together with as much as 10–15% of sucrose calcd. to the wt. of the stalk. Stewart has suggested the possibility of a more complete utilization of the maize by extg. the sugar from the stalk and using the refuse and other parts of the plant for the manuf. of alc. and paper. D. has shown that sucrose of good taste and color may be extd. from maize under well controlled practical conditions. This extn. has been successfully demonstrated in France, Egypt, S. Africa, and Argentine. It is essential that the stalk be treated immediately after cutting since enzymic inversion of the sucrose takes place very rapidly. H. R. SMITH.

Influence of temperature on viscous fermentations of cane juices. W. L. OWEN. *Intern. Sugar J.* **17**, 275–80(1915).—A large majority of the cane juices which ferment undergo acetic fermentation. However, certain heretofore undetd. conditions have resulted in a marked viscous fermentation in a few instances each season. It seems improbable that the predominance of one or another group of microörganisms in the juice should direct the course of the fermentation since all of the juice is inoculated with each of the various species which occur in the rind of the cane. It was thought that variations in temp. might cause one or the other type of fermentation to predominate. Expts. to det. the rôle of temp. were made using an Ostwald viscosimeter to establish the relative viscosities. These expts. showed that viscous fermentation occurs more frequently when the juice is stored at low temp. than when kept at high temp. This agrees with the observed occurrence of viscous fermentation in La. in that more difficulty from this source is experienced in Dec. than in Oct. It is probable that frozen cane "gums up" the mill on account of the viscous fermentation produced by the low temp. H. R. SMITH.

Evaporation in the sugar industry. E. BARBET. *Bull. assoc. chim. sucr. ind.* **32**, 111–34(1914).—An exhaustive treatise on the theoretical principles involved in the concn. of sugar solns. Complete bibliographies and discussions of "Emulsion Theory," etc., are included. B. concludes with a detailed description of the construction and operation of an evaporator which conforms to the principles brought out in the theoretical discussion. H. R. SMITH.

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The manufacture of by-products in the sugar factories of Demerara. M. BIRD. *Louisiana Planter* 55, 109–10(1915).—The principal products are molascuit and rum. For the molascuit, the megass is finely ground, sifted and then thoroughly dried on the brick flues connecting the boilers with the factory chimney. In Demerara these flues are of considerable length and their tops form a convenient and safe heated surface on which the meal is spread until dry. The desiccation of the molasses is also important as a product is desired in which the sucrose content constitutes half or more of the total wt. of the molascuit. The manuf. of rum takes precedence over that of molascuit and is made from refuse molasses after all possible sugar has been extd. A number of details are given for the prep. of these products. A. GROSS.

Commercial sugar of milk (ENGLAND) **17. Fertilizing salts and sugar beets** (VIVIEN) **15.**

KLUYVER, A. J.: **Biochemische Suikerbepalingen.** Leiden. 224 ss. 6 M.

PRINSEN-GEERLIGS, H. C.: **Practical White Sugar Manufacture.** London: N. Rodger. 184 pp. 12 s.

SPENCER, G. L.: **Handbook for Cane-Sugar Manufacturers and their Chemists.** 2nd ed. New York: Wiley. 331 pp. $3.00.

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29. LEATHER AND GLUE.

LLOYD BALDERSTON.

The specific gravity of leather and its commercial application. OSKAR RIETHOF. *J. Am. Leather Chem. Assoc.* 10, 456–8(1915).—In general, high sp. gr. implies heavily loaded leather, so it is important for the buyer to know the sp. gr. R. finds it by cutting out a rectangular piece, measuring the length, breadth and thickness in many places and multiplying the average of these together to get the vol., which is then divided into the wt. Values range from 0.65 to 1.30. L. B.

Fat extraction of leather. L. E. LEVI AND A. C. ORTHMANN. *J. Am. Leather Chem. Assoc.* 10, 445–8(1915).—Ten g. of leather are placed in a bottle with 200 cc. low b. p. petr. ether and shaken occasionally for two days, when 100 cc. are pipetted into a tared dish and evapd. Results agree well with those obtained by extn. in a Soxhlet extractor. L. B.

Rapid manipulation of Kjeldahl's method. A. T. HOUGH. *Collegium* (London edition) 1915, 126–7.—A modification of the permanganate method is described. The digestion of leather may be completed in $^1/_2$ hr. L. B.

Analysis of tanning materials. Reply to Dr. Callan. H. G. BENNETT. *J. Soc. Chem. Ind.* 34, 822(1915); cf. *C. A.* 8, 3781; 9, 978, 2161.—Callan states that Stiasny's metaphosphoric, salt and gelatin test will not show 150 mg. of gallic acid in 50 cc., which is about the max. amt. of gallic acid likely to be present in a detannized soln. even after concg. to half its vol. B. finds that a 0.3% soln. of gallic acid (150 mg. for 50 cc.) gives distinct turbidity with Stiasny's test indicating apparent presence of tannin. A 0.5% soln. of gallic acid will give a decided positive result. Stiasny has said that his test is unreliable in the presence of gallic acid. It is even more unreliable in the presence of catechin. Decidedly positive results are obtained with solns. having less than 0.3% catechin. There is no doubt that with many materials, such as babla, lentisco, and gambier, the gallic acid in the non-tan filtrates may easily exceed 0.3%. B. thinks the official test for detannization with a 1% gelatin 10% salt soln. is sufficiently delicate for its purpose as it will detect 1 part gallotannic acid in 100,000 parts water. Even with B.'s proposed extra diln. the error is not over 0.1%, which seems

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negligible compared with the errors up to 12.0% which are avoided by this method. B. considers it futile to use German hide powder with any method of analysis because of its well known affinity for non-tannins. J. S. ROGERS.

Sulfurous acid in sulfited tannin extracts. CARL SCHIFFKORN. *Collegium* 1915, 101–8, 146–54.—*Qualitative.* The liquor, containing about 0.4% tannin, is detannized, and 100 cc. of the resulting soln. warmed with 3 g. MgO, filtered, granulated Zn added, then HCl. On standing in a beaker covered with $Pb(OAc)_2$ paper, a brown color (H_2S) indicates SO_2 in the ext. Or, mix 2–3 g. ext. with H_2O and 1–2 cc. of 25% H_3PO_4 in a 100 cc. Erlenmeyer flask which is then corked with a strip of iodate-starch paper suspended 1 cm. above the liquid. If no blue appears after 10 min., heat 10 min. on water-bath, cool and let stand $^1/_2$ hr. If there is still no blue, SO_2 was absent. Or, over a dish in which 1–2 g. of the ext. have been dissolved, with a little H_3PO_4, place a watch glass on which hangs a drop of dil. soln. of I in KI, rendered blue with starch. In the presence of SO_2 the drop is decolorized in 5 min. *Quantitative.* In 200 cc. boiled H_2O dissolve 2–3 g. of ext., adding NaOH to weak alk. reaction. Let stand 1 hr. Lead CO_2 through the liquid and through a Liebig condenser terminating in a U-tube containing a soln. of 0.5 g. I and 0.75 g. KI in 50 cc. H_2O. Add 10 cc. of 25% H_3PO_4 and distil off $^1/_2$ the liquid. Acidify I soln. with HCl, boil till yellow color is discharged, and then ppt. with $BaCl_2$. For volumetric detn. the SO_2 may be collected in a standard soln. of KIO_3, the liberated I expelled and the excess of KIO_3 titrated. Free SO_2 is detd. by distg. from MeOH in a current of CO_2 and collecting the SO_2 in H_2O_2. Excess of H_2O_2, CO_2, and alc. are expelled by heat and the H_2SO_4 titrated cold, or pptd. as $BaSO_4$. L. B.

New or seldom used tanning materials. R. LAUFFMANN. *Collegium* 1915, 197–209.—Analyses of 20 materials are given with their tannin acidity, soly. in EtOAc, color produced on mordanted cloth strips, and behavior toward Br, $Pb(OAc)_2$ and HCHO. They are also classified as catechol or pyrogallol tannins. L. B.

Moellons and hard grease. GEBHARDT BUMCKE. *J. Am. Leather Chem. Assoc.* 10, 448–56(1915).—B. prefers Marcusson's method for moisture in moellons (distn. with xylene) to heating over a free flame. Analytical details in regard to unsaponifiable, oxidized fatty acids and free fatty acids are discussed at length. For melting point of hard greases, B. prefers the Ubbelohde method. Both the film and capillary methods are open to objection because of the impossibility of securing precisely similar conditions in any two detns. L. B.

Wattle bark in Natal. *Board of Trade J.* June 10, 1915; *J. Soc. Chem. Ind.* 34, 726.—A wattle bark ext. factory is to be erected at Merebank, Natal. The green bark will be subjected to a series of mechanical pressings by means of heavy bronze rollers, hot water and tan liquor washes being applied to the pressed bark between each set of rollers. The extn. is effected within 2 min., and no darkening in color is possible as occurs in the process of leaching in pits. E. J. C.

JETTMAR, J.: **Die Lederhandschuhfabrikation.** Leipzig: B. F. Voigt. 356 ss. 13.50 M.

U. S., 1,152,294, Aug. 31. A. L. CLAPP. **Leather-board stock** is formed by treating leather pulp with a filler produced by pptn. from a soln. of alkali, rosin and glue by addition of $Al_2(SO_4)_3$. Cf. *C. A.* 9, 1133.

U. S., 1,153,139, Sept. 7. H. SNELL. **Plastic shoe-bottom filler** (for filling the space between the inner and outer soles); formed of granular cork or similar solid filler 2 lbs., rosin 1 lb., castor oil and copal or similar resin 1 lb. and vulcanized vegetable oil 1 gill.

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30. RUBBER AND ALLIED SUBSTANCES.

R. T. STOKES.

Jan van Geuns and the discovery of the vulcanization of rubber. W. P. JORISSEN. *Chem. Weekblad* 12, 799–804(1915).—Historical. E. H.

Investigations on caoutchouc and gutta-percha. G. H. HILLEN. *Z. angew. Chem.* 28, I, 349–54, 357–61(1915).—Recent advances are reviewed, numerous references to the literature being given. E. J. C.

Further remarks on the work of G. Steimmig, "Caoutchouc from isoprene." C. HARRIES. *Ber.* 48, 863–8(1915); cf. *C. A.* 8, 3376.—The redistd. isoprenes (*a*) from the Elberfelder Farbenfabrik and (*b*) from the Badische Co. were polymerized by heating in sealed tubes for 6 weeks at 70°. The caoutchouc from (*a*) was about $^{9}/_{10}$ sol. in hot C_6H_6 while that from (*b*) was almost entirely sol. The caoutchoucs were ozonized and were treated exactly according to Steimmig (*C. A.* 8, 1678) for the isolation of anilopyrrole, for the detn. of acetonylacetone, and for the detn. of succinic acid. None could be detected, showing a decided change in the structure of the synthetic rubber from that obtained by Steimmig; this is due to the purifying of the isoprene. The investigation was carried still further, using Harries method for sepg. the acids from the ketones by means of the Ca salts. 50 g. of the caoutchouc from (*a*) gave 0.11 g. acetonylacetone, and about 0.8 g. of dimethyl succinate; while that from (*b*) gave 0.13 g. of acetonylacetone ($^{1}/_{16}$ of the amount found by Steimmig) and 2 g. of dimethyl succinate. For comparison a synthetic caoutchouc made from technically purified isoprene was similarly investigated, 0.3 g. acetonylacetone and 1.5 g. dimethyl succinate being found. The formation of 1,6-dimethylcyclo-octadiene, 1-5, is due to the catalytic action of the impurities in isoprene. H. believes that if the isoprene were more carefully purified this isomeric caoutchouc would not be formed.

W. F. ZIMMERLI.

Pontianak (Jelutong) rubber resin. C. ELLIS AND A. A. WELLS. *J. Ind. Eng. Chem.* 7, 747–50(1915).—The I value increases on heating the resin. The solubility of Pontianak in 5 commercial solvents—turpentine, heavy benzine, solvent naphtha, benzene, light benzine—was examd. and the results tabulated. The solubility depends on (1) the nature of the solvent and (2) the heat treatment of the resin. Of the above, C_6H_6 has the greatest solvent action, benzine the least. The soly. and the proportion of unsatd. compds. both increase on heating. The resin is practically unsaponifiable.

ISADOR MILLER.

Researches on African rubbers. F. HEIM, *et al.* *Bull. Agr. Intelligence* 6, 581–2 (1915).—The "Gohine" liane (*Landolphia heudelotii*) is a source of rubber in French West Africa. Samples prepd. by different methods of coagulation show only slight differences in their technological value. The writers have analyzed 2 samples of this rubber from the Upper Senegal-Niger region and give data concerning the strength, extension, nerve, elasticity and permanent stretch of these 2 samples, and of others from the same trees grown in different stations and prepd. by various methods of coagulation. Compared with fine hard Para they show equal strength and greater resiliency and extensibility. The authors have analyzed 3 samples of rubber from French Equitorial Africa, known as, "Owouina Noir" or "Andang," "Kondo" or "Pembe," and "N'Cauli." They were not able to det. their botanical origin but the analytical and technical data show that "Owouina" rubber is interesting on account of its great chem. purity, comparable to that of Para. "Kondo" rubber also appeared to possess a fair technological value. EDWARD J. KELLEY.

DUBOSQ, A. ET LUTTRINGER, A.: **Le caoutchouc. La chimie nouvelle, ses syntheses.** Paris. 18 M.

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CHEMICAL ABSTRACTS

Vol. 9. NOVEMBER 20, 1915. No. 22.

I. APPARATUS.

L. C. JONES.

Simple and unbreakable vacuum desiccator. F. F. BRUIJNING. *Chem. Weekblad* 12, 773–5(1915).—A cylinder is cut out of a water pipe of a desirable diameter, both ends are grounds mooth, and a hole, which is to receive the air cock, is bored at about $^2/_3$ of the height. Bottom and cover consist of glass plates 3 cm. thick. By combination of two or more cylinders of the same diameter, desiccators can be made of any desirable height. J. T. FLOHIL.

Quantitative microanalysis. F. EMICH. *Monatsh.* 36, 407–40(1915).—E. describes 2 models of the modification of the ordinary Nernst balance, sensitive to 0.003 and 0.001 mg. These are useful in detg. ash, water of crystn., Pt in chloroplatinates, Cr, etc., in samples of 0.1 to 0.3 mg. or 0.03 to 0.05 mg. with an accuracy of 2%. The torsion balance of Hartmann and Braun is suitable for the detn. of ash in samples of several mg. A new projection spring balance for lecture work, based upon Jolly's balance, is also described. C. J. WEST.

A simple grinding apparatus for the laboratory. A. COBENZL. *Chem. Ztg.* 39, 708(1915).—An old separatory funnel is mounted horizontally on 2 bearings made of bent hoop Fe attached to a wooden base, one under the neck and the other between the body and the cock. A pulley is attached to the stem. Glass or metal beads are used for grinding. J. H. MOORE.

Device for emptying filters. J. E. MCNUTT. *J. Am. Leather Chem. Assoc.* 10, 515–6(1915).—A siphon is described and illustrated which, by means of several coils at the bend, starts even when several bubbles of air have been drawn in, thus enabling many filters to be emptied completely without restarting the siphon. The short arm is made up chiefly of rubber tube, which is pinched with the thumb and finger while the transfer from one filter to the next is made. L. B.

Absorption of air by charcoal cooled to the temperature of liquid air. C. T. KNIPP. *Science* 42, 429–30(1915).—Description of 2 pieces of app. by which the absorption may be shown in a lecture. One is based on the discharge of electricity through air in a tube changing from a spark to a glow. The other app. is arranged to show the absorption by the barometric column supported in a vertical tube dipping into a bath of Hg. E. B. MILLARD.

Some novel laboratory experiments. F. W. JORDAN. *Proc. Phys. Soc. London* 27, 461–76(1915).—Two types of condensation calorimeters are discussed, in which errors arizing from heat and wetness of the vapor are practically eliminated. One of these calorimeters was constructed from an ordinary vacuum flask. New and simple apps. are described for use in detg. thermal cond. of metal bars, Poisson's ratio, and for measuring coincidence period of a Kater and clock pendulum. A differential telephone receiver for elec. measurements and expts. on interference fringes are described. PAUL D. FOOTE.

The Zeleny electroscope. FRANK HORTON. *Phil. Mag.* 30, 381–3(1915); cf. *C. A.* 6, 1710.—A modification is proposed in which the gold leaf is suspended from

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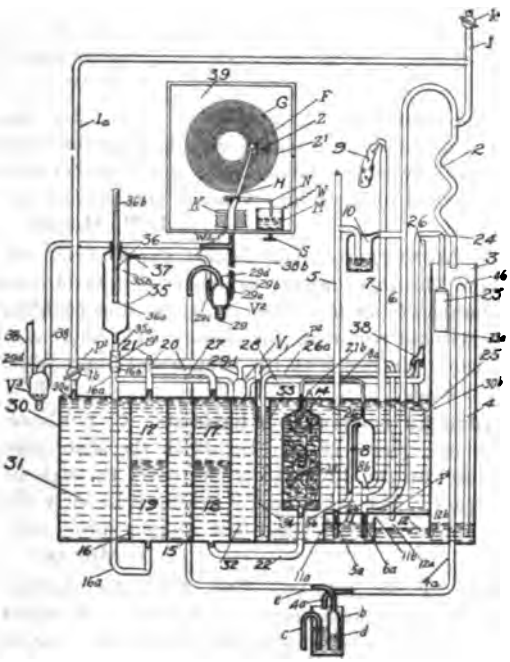
a small Al wheel so that the leaf always oscillates about the axis of the wheel. The charged plate is faced with C to prevent sticking of the leaf. G. L. WENDT.

A sensitive photoelectric cell. E. O. HULBURT. Johns Hopkins Univ. *Astrophys. J.* 41, 400–1(1915).—A description of the technic of the construction of the cell. F. A. HARVEY.

The measurement of the temperature of solid bodies. FELIX LECONTE. Brussels. *Electrician* 75, 813(1915).—Attention is called to sources of error in the measurement of the surface temps. of commutators, etc., by means of a thermometer. Tin foil should not be used, and if the bulb be covered with cotton waste, evapn. of water from the latter may cause a low result. L. uses a thermometer of thin glass, containing a minimum of Hg and having a max. of contact surface, a stem 5 to 6 mm. outside diam., and a 100° C. scale 150 mm. long. SHERMAN EASTMAN.

Electric vacuum furnace (OESTERHELD) 4.

U. S., 1,153,911, Sept. 21. J. W. HAYS and C. W. HAYS. **Gas-analyzing apparatus,** for showing analysis and draft pressure of furnace gases. Furnace gases, in which the amt. of CO_2 is to be detd., are drawn, by suction of H_2O supplied through the pipe 1 to an aspirator 2, through a filter (not shown) and supply pipe 5 to a measuring vessel 8 and an absorption vessel 14 filled with steel wool covered with a film of absorbing liquid. The vessels 18 and 19 are filled with light oil 17 overlying a lower layer of KOH soln. 18 and distd. H_2O 19, the chambers 33 and 11 are filled with distd. H_2O and the tank 30 is filled with H_2O from the supply pipe 1a. H_2O rizing in the chamber 3 exerts pressure on the bodies of H_2O 12 and 11 and the air between them and distd. H_2O from the body 11 is forced up into the tubes 5, 6, 7 and 8. When it reaches the points 5*b* and 6*b* the gas ceases flowing through the tubes 5 and 6 and is drawn through the liquid seal 10 to an expansion bag 9. When the H_2O rizes in the tubes 5, 6 and 7 beyond the point 8*b* the pressure in the vessel 8 forces the gas into the absorption chamber 14. KOH soln. from 14 displaces the oil 17 which in turn displaces the H_2O 19 and H_2O rizing in the tube 16*a* compresses air in the chamber 35 which controls the recording pen on the chart *G*.



U. S., 1,153,912, Sept. 21. J. W. HAYS and C. W. HAYS. **Gas-analyzing apparatus.** *B* is a gas-measuring chamber supplied with the gas to be analyzed from the tube *IT* by suction of an aspirator *P*. When the H_2O rizes from the chamber *WC* it seals the lower ends of the tubes *IT* and *OT* and cuts off the supply of gas. Ex-

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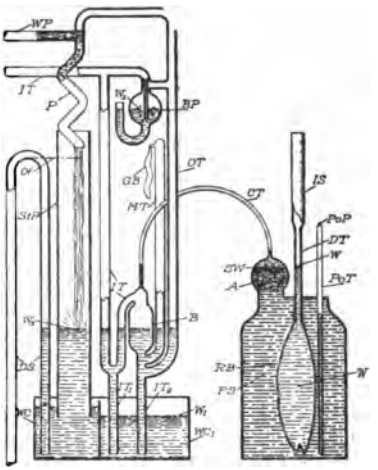
cess gas is forced into the expansion bag *GB* and the measured sample of gas passes to the absorption material on a fibrous carrier *SW* in the chamber *A*. The rise and fall of H_2O in the graduated tube *IS* indicates the amount of absorption of CO_2 from the gas.



U. S., 1,154,433, Sept. 21. W. M. REECE. **Acetylene generator.**

Brit., 12,299, May 19, 1914. G. DESAULLES. App. for the **drying, humidifying,** and the like treatment of materials in bulk comprizes a convex helicoidal surface rotating on a vertical axis within a concave co-axial helicoidal surface, the material passing from one surface to the other through the app.

Brit., 12,328, May 19, 1914. H. HOFFMANN APPARATEBAU GES. **Tanks for storing inflammable liquids.**

Brit., 12,735, May 23, 1914. EVERSHED & VIGNOLES and W. CLARK. In app. for **testing the amount of dissolved matter in liquids** by measuring the elec. cond., a thermometer is placed in the liquid path between the electrodes, and the position of the thermometer is adjusted according to its reading so as to vary the conductance and provide a correction for temp. variations. For this purpose, the thermometer is carried in a sliding frame provided with a scale and a pointer. The upper electrode is ring-shaped to accommodate the thermometer, and a constant level of liquid is maintained by the provision of an overflow.

2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS.

Assistants: E. B. MILLARD and A. B. CARTER.

Johann Wilhelm Hittorf. A. HEYDWEILLER. *Physik. Z.* 16, 161–79(1915); cf. *C. A.* 9, 1863.—Obituary. E. B. MILLARD.

Recent tendencies in high school chemistry. ROBERT H. BRADBURY. *J. Franklin Inst.* 180, 449–61(1915). E. J. C.

Second report to the Council of the Committee on Nomenclature and Symbols. *Proc. Phys. Soc. London* 27, 305–6(1915).—Nomenclature and symbols for 34 physical quantities are recommended by a committee composed of J. J. Thomson, H. L. Callendar, A. Campbell, C. Chree, G. C. Foster, W. Eccles, Geo. Greenhill, A. Russel, R. J. Strutt, S. P. Thompson, and W. Watson. For 1st report cf. *C. A.* 9, 2337. PAUL D. FOOTE.

Periodic system of the chemical elements. A. BILECKI. *Chem. Zentr.* 1915, II, 1.—After a critical discussion of the various systems already proposed, B. suggests a modification of Crookes' curve as the basis for developing another system. The new system is a space curve consisting of 2 lemniscates on a perpendicular axis, representing the pairs of elements. The noble gases form the transition group between the periods of the system as usual. The length of the cycle is proportional to the square of the odd numbers of elements. The variations in properties of the elements within a group are shown by another arrangement bounded by elements of small valence (0 or 1)

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and low f. p. By the use of polar coördinates and a division of the system into 2 parallel paths the regularities in the new system are made clearer. There follows a discussion of the bearing of the periodic system on the origin of the elements. (The original paper was published separately by Buchhold and Diebel, Troppau 1915.) E. B. M.

German chemical nomenclature. E. L. KENNAWAY. *Chem. News* **112**, 97–8 (1915).—Explanation of terms for those not familiar with German names or constructions. E. B. MILLARD.

Polymorphic transformations of solids under pressure. P. W. BRIDGMAN. *Proc. Am. Acad. Arts Sci.* **51**, 55–124(1915); cf. *C. A.* **9**, 2479.—Expts. have been made over a pressure range of 1 to 12,000 kg. per sq. cm. and over a temp. range of 0 to 200°. The exptl. procedure was, except for minor details, like that of previous papers. The solids (if insol. in kerosene) were rammed dry into a piece of steel tubing, and placed in the pressure app. A thermodynamic discussion is given (cf. *C. A.* **9**, 2617), followed by data on KSCN, NH_4SCN, K_2S, $KClO_3$, KNO_3, C_2Cl_6, CBr_4, AgI, HgI_2, phenol, and urethan. The discussion of this data is reserved for future papers. E. B. M.

Crystals as molecular compounds. PAUL PFEIFFER. Zürich. *Z. anorg. allgem. Chem.* **92**, 376–80(1915).—A discussion of possible mol. configurations of crystal mols., based on the work of the Braggs and on Werner's theory of the constitution of double salts. GEORGE W. MOREY.

The visualization of the space lattice of crystals by Röntgen rays. M. VON LAUE. Zürich. *Fortschr. Min. Krist. Petr.* **4**, 43–72(1914).—A summary of the work in this field, with special reference to the mathematical side. Reproductions of photographs of the interference patterns obtained, and a diagram of the structure of diamond, showing that the carbon atoms are united in hexagonal groups (benzene rings), are given. E. T. WHERRY.

Quantitative determination of the sensitiveness of crystal detectors used in wireless telegraphy. E. GIURGEA. *Bull. sci. acad. Roumanie* **2**, 166–71(1914); *Chem. Zentr.* **1915**, II, 7.—A crystal detector has different conds. according to the direction in which the current is passed. This difference in cond. is not proportional to the actual sensitiveness of the detector, as measured on a galvanometer in the detector circuit. E. B. MILLARD.

The Stark effect and atomic structure. GORDON S. FULCHER. Univ. Wisconsin. *Astrophys. J.* **41**, 359–72(1915).—A critique of certain recent work. F. A. H.

Molecular diameter and molecular weight. W. HERZ. *Z. Elektrochem.* **21**, 373 (1915).—The mol. diam. has been calcd. from the equation $d = 2\gamma v/L$, where γ is the capillary const., v is the sp. vol., and L is the heat of evapn. of 1 g. liquid. Most of the diameters so calcd. are of the order of 10^{-8} cm. In homologous series the mol. diameter in general increased with the mol. wt., but the mol. diam. also depended somewhat on the structure of the compd. Isomers did not have the same mol. diameter, and the differences were generally greater for the compds. which differed greatly in constitution. E. B. MILLARD.

The cohesion of solids. HERBERT CHATLEY. *Proc. Phys. Soc. London* **27**, 443–60(1915).—Theoretical and critical discussion. PAUL D. FOOTE.

Secondary periodicity. E. V. BIRON. *J. Russ. Phys. Chem. Soc.* **47**, 964–88 (1915).—The general opinion is that the elements follow the law of triads according to which the properties of the middle element in any group of 3 similar elements in the periodic system are intermediate between those of the 1st and those of the 3rd. An exhaustive exam. of the various properties of such triads and of their compds. shows, however, that this law fails to hold good in a great many cases. Thus the affinity for O of Br is greater than that of I, that of Se than that of Te, and that of

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As than that of Sb. Similar conditions prevail with respect to numerous other properties of triads, as is shown by a mass of evidence cited by B. In order to explain this fact, B. sets up the hypothesis that, aside from the law of regular periodicity, all elements also follow a law of secondary periodicity. As to which set of properties follows one or the other of these laws, depends upon the kind of valences exercized by the elements in the formation of compds. in a given case, the properties of those compds. formed according to normal valences following the regular law of periodicity, while the properties of compds. formed according to contravalences (Abegg, *Z. anorg. Chem.* **39**, 330) are regulated by the law of secondary periodicity. In the He group of chem. inactive elements the hypothesis can be verified only upon phys. properties. The normal valences of these elements being zero, their contravalences, according to A., are 8, and their properties, like comparative difficulty of liquefaction, their spectroscopic behavior, etc., follow the law of secondary periodicity. Numerous tables and lengthy discussions are given. H. M. GORDIN.

Note on the apparent specific volumes of alcohol in aqueous mixtures of varying concentration. HORACE T. BROWN. *Analyst* **40**, 379–83(1915).—B. has studied the progressive changes of vol. which occur during the dilution of alc.-water mixtures and has calcd. the apparent sp. vol. of the alc. at various concns. on the assumption that the observed vol. changes only affect the alc. The apparent sp. vol. of alc. in all concns. may be expressed by the formula $[1 - (D - W)]/W$ where D is $d_{15.6}^{15.6}$ of the mixture and W the wt. of alc. in 1 cc. A steady decrease in the sp. vol. of the contained alc. is observed until d. 0.9652 is reached. Beyond this point the sp. vol. increases. The tentative explanation is offered that this point marks the complete formation of a definite hydrate of alc. and that the subsequent expansion is an expression of progressive dissociation of this hydrate. It is pointed out that alc. of d. 0.9652 contains 24.83% by wt. of alc. while a hydrate of the compn. $C_2H_6O + 8H_2O$ would contain 24.21%. P. B. DUNBAR.

Action of metals on chlorides of carbon. ENRIQUE V. ZAPPI. Buenos Aires. *Anales soc. quim. Argentina* **2**, 217–28(1914).—Z. studied the decompn. of chlorides of C by metals in order to ascertain the relation between the number of atoms in the mol. of the chloride and the mol. complexity of the C produced by the decompn. of the latter. Data are given regarding various chlorides of C which are available for such an investigation; CCl_4, C_2Cl_6, C_6Cl_6 and $C_{10}Cl_8$ were selected for the expts. C_2Cl_6 was obtained from the residue (mixt. of CCl_4, C_2Cl_6, $AlCl_3$, C and resinous substances) remaining from the action of Al on CCl_4. An attempt was made to secure reaction between the metals and chlorides at as low a temp. as possible in order to diminish the possibility of polymerization. The physical condition of Al was of detg. influence in the reaction of this metal; Al as an impalpable powder showed no reaction with CCl_4 when heated in a closed tube at 280°. This failure to react is probably due to the layer of oxide with which the Al particles are covered; the amt. of this oxide layer is less in proportion in larger forms of Al (coarse powder, wire, sheets, etc.) and hence plays a minor role. Ordinary Al in any form has no action on CCl_4 in the cold (4 mos. contact), while activated Al reacts slowly with production of a resinous substance; both ordinary and activated Al react with CCl_4 with apparently the same intensity when heated (except that Al as an impalpable powder does not react even when heated to 280° in a sealed tube). Z. studied the reaction of 10 g. Al and 50 g. CCl_4 when heated for 6 hrs. at 100–20° in a sealed tube; the tubes, when opened, contained a black liquid with a black substance (containing crystals of C_2Cl_6) adhering to the walls. Unchanged Al and CCl_4 with C_2Cl_4 and higher chlorides of C were found in the fluid portion; an almost pure (99.55%) amorphous C was separated from the mass adhering to the wall of the tube. This C (d. 1.28) was slowly attacked by cold HNO_3 (more

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rapidly by hot HNO_3); it dissolved completely in warm HNO_3 and $KClO_3$ (the reaction was less pronounced in the cold). Z. attempted to obtain mellitic acid (indication of 12 atoms at least in the mol. of C) by oxidation of this amorphous C with alk. (KOH) $KMnO_4$. He got a white, cryst. substance which was easily sol. in H_2O, contained no halogen, produced CO_2 when ignited with CuO, burned without residue on Pt and produced C_6H_6 when heated with soda-lime; an insufficient amt. was available for detn. of C, O and H. Neither ordinary nor activated Al reacted with C_2Cl_4, C_6Cl_6 or $C_{10}Cl_8$ when heated in a closed tube at 180° for 6 hrs.; incipient reaction of C_6Cl_6 and Al was observed at 300°. Mg (powder and filings) failed to react with CCl_4, C_2Cl_6 or $C_{10}Cl_8$ at 180°; Mg and C_6Cl_6 failed to react at 300°. Fe (powder reduced by H) failed to react with CCl_4 in the cold after 4 mos. contact; slight reaction occurred at 100–20°. Fe and $C_{10}Cl_8$ failed to react after 6 hrs. contact at 180°. Na (as wire 0.5 mm. in diam.) and CCl_4 did not react after 4 mos. contact in the cold and 6 hrs. contact at 100–20°. Na and C_2Cl_6 did not react at a temp. at which the former melted. No reaction between Na and C_6Cl_6 was observed at 180°; reaction at 300° was slight and no C was produced. Amorphous Si (prepd. according to Vigouroux) failed to react with CCl_4, C_2Cl_6 (6 hrs. contact) or $C_{10}Cl_8$ at 180°. No reaction between Si and C_6Cl_6 was observed after 6 hrs. contact at 300°. It is concluded that: (1) the C which is produced by the action of CCl_4 and Al has a complicated mol. structure with at least 12 atoms to the mol. and that the reaction $CCl_4 + M = MCl_4 + C$ is accompanied by polymerization of the C formed; (2) the temp. at which a chloride of C is decompd. by metals increases with the mol. wt. of the former; (3) the readiness with which metals and chlorides of C react bears a direct relation to the heat of formation of the corresponding metallic chlorides. H. S. PAINE.

Form of ultramicroscopic particles of silver. R. GANS. *Ann. Physik* 47, 270–84 (1915); cf. *C. A.* 6, 2026.—The detn. of the absorption curve for colloidal Ag is a sensitive method of detg. the shape of the particles, as with the Au colloid. The Ag amicrons are very nearly spherical. The statement of Siedentopf and Zsigmondy that the Ag particles are discs or plates is wholly incorrect. E. B. MILLARD.

New experiments on metal clouds. RICHARD LORENZ. *Physik. Z.* 16, 204–7 (1915); cf. *C. A.* 9, 2474, 2490.—Pure $PbCl_2$ fuses to a clear, light yellow melt. If a piece of clean Pb be placed in the melt, it first fuses to a shiny sphere, then throws off dark brown clouds with almost explosive violence until the whole melt has been filled with the intensely colored cloud. After cooling, the metal is found to be present in ultramicroscopic particles; this shows the colloidal nature of "Lorenz metal clouds," at least for the solid state. In thin plates the melt appears clear in transmitted light, and opaque and cloudy in reflected light. It was not possible to bring the melt under an ultramicroscope, but the crystals contg. the cloud could be so treated. Optically clear crystals were made by the methods in *C. A.* 9, 1565. In the crystals the particles are often arranged in tri-planar systems. E. B. MILLARD.

The spontaneous formation of colloids of metals in contact with a solvent. H. NORDENSON. *Kolloidchem. Beihefte* 7, 91–109(1915).—The results of Scala and Traube-Mengarini (*C. A.* 4, 1436, 2079; 5, 2023; 6, 1699) could not be obtained. Boiling a piece of pure Pt in pure H_2O or alc. up to 60 hrs. did not show any colloidal formation. The weight of the metal was not appreciably reduced. Former results where a colloid was observed under similar conditions were most probably due to impurities in the Pt. Au gave similar negative results. Pb when boiled with water, alc. or acetone was reduced in weight owing to the formation of an oxide or hydrate and the appearance of this in suspension in the solution caused the error in concluding a colloidal formation. This oxide or hydrate forms even in the organic solvents when the air is excluded. Cu, Fe, Ni, Zn, Al and Sn also form oxides or hydrates, more or less

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easily according to the metal, when similarly treated. Ag gave a colloidal soln. of the metal which is shown to be caused by the reduction of a crystalloidal substance (oxide or hydrate), in which form the Ag is first dissolved from the metal. The expts. of Kimura (*C. A.* 8, 2287) in which a colloid was formed when a metal was repeatedly heated and then cooled under H_2O could not be substantiated. The observed colloid formation was most probably due to oxides of the metals as was shown in expts. in boiling the metal in solvents. WILLIAM F. ZIMMERLI.

The formation of colloids of metals when they are exposed to light, Röntgen and radium rays. H. NORDENSON. *Kolloidchem. Beihefte* 7, 110–36(1915).—The expts. of Svedberg (*C. A.* 4, 1418, 1705) were continued. A plate of Ag was immersed in alc. and exposed to ultraviolet light and the loss in weight detd. from time to time. No quant. relation between the colloid formation and the time and temp. could be established owing to exptl. errors. A qual. investigation of the formation of colloids of metals when immersed in H_2O, alc. and other solvents and exposed to ultraviolet, Roentgen or radium rays was continued. It was found that the action of Röentgen and radium rays was similar to but weaker than that of ultraviolet rays. Silver gave a metallic colloid. Au, Pt, Fe, Co, Ni, Cr, Mn and Bi did not form colloids. Cu, Hg, Zn, Pb and Sn gave colloidal formations but their nature could not be established. Because of the easy oxidation of the metals it could not be detd. whether or not Al, Mg and Cd formed colloids. On immersing pure Ag in pyridine or C_6H_6 no colloid was formed, but in EtOH, MeOH, acetone and H_2O the metallic colloid was formed and identified. The colloid formation is due to the activity of the rays in forming H_2O_2, which attacks the metal, forming an oxide or hydrate, which in turn is dissolved in the crystalloid form and is then reduced to metallic colloid by the reducing action of the light rays. This could be substantiated in that if a piece of Ag is immersed in a 0.01% H_2O_2 soln. and the resultant soln. treated with a reducing agent colloidal Ag is formed. The other metals which are more easily oxidized (Cu, Hg, Zn, Pb and Sn) are similarly attacked by the H_2O_2 and the reaction accelerated by the light, but a metallic colloid is not formed. WILLIAM F. ZIMMERLI.

Heat effect of solution and tension of saturated vapors above solutions. M. LEVAL'T-EZERSKII. *J. Russ. Phys. Chem. Soc.* 47, 787–805(1915).—Continuing his investigations on this subject (*C. A.* 9, 1711), L. establishes 2 schemes for the relation between the lowering of the vapor tension above a soln. and the changes in the concn. of the latter: (1) The lowering of the v. t. with increasing concn. is greater, and (2) smaller than it would be if it were proportional to the concn. Making use of Schiller's ideas (*Wied. Ann.* 53, 396; 60, 755), the following rule is found to hold good: When the above relation is according to (1), diln. is accompanied by contraction; when it is according to (2), diln. is accompanied by dilation. The rule was verified upon numerous salts, the data being taken from the literature. H. M. GORDIN.

Physico-chemical attractive force. Reply to N. A. Kolosovskii. L. G. GURVICH. *J. Russ. Phys. Chem. Soc.* 47, 1310–2(1915).—Polemical against Kolosovskii (*C. A.* 9, 2475). G. maintains that his exptl. data are in better accord with his formula than with that of Freundlich, particularly for high concns. of adsorbed substance. G. also asserts that he made it perfectly clear that his phys. chem. force reacts between mols., and that he described this force with sufficient lucidity. H. M. GORDIN.

Physico-chemical attractive force. II. L. G. GURVICH. *J. Russ. Phys. Chem. Soc.* 47, 805–27(1915).—Continuing his work on this subject (*C. A.* 8, 2090), G. examd. the amts. of heat evolved in the adsorption of different liquids by the same amts. of floridin, Al_2O_3 and bone charcoal when the adsorbents are thoroughly moistened by the liquids. As liquids were used H_2O, CS_2 and numerous org. compds. belonging to different series. The results showed that in all cases the greatest heat effects are pro-

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duced in the adsorption of especially reactive substances, such as contain double unions or O or N capable of rizing to higher valences. That this is not due to formation of definite mol. compds. between adsorbent and adsorbed substance is shown by the absence of stoichiometric relations between the amts. of the adsorbed substances when the same adsorbent is satd. with them. On the other hand, if instead of wt., vol. is used as standard of comparison, it is found that each adsorbent is capable of adsorbing the same vol. of a liquid, no matter what its nature is. For these expts. the adsorbents were kept in the vapors of different liquids until adsorption was complete. The 2 facts, constancy of vol. and variation of heat effect for different liquids capable of being adsorbed by a given amt. of an adsorbent, show that around each mol. of an adsorbent there is formed a sphere of adsorbed liquid which is of the same dimensions for all liquids but within which different liquids are held with a different degree of tenacity, *i. e.*, are in a different state of compression. The lack of proportionality between heat effect and wt. of adsorbed substance and the parallelism between heat effect and chem. reactivity show that the attractive force of adsorption is of a phys.-chem. nature, differing from the purely chem. force in not being influenced by valence, and from purely phys. forces in being specific, and not universal like gravitation. It must, therefore, be assumed that, aside from phys. and chem. energies, mols. contain a kind of "residual energy" which conditions the phenomenon of adsorption. While with respect to heat effect there is no strict parallelism between the amts. of different groups of liquids capable of being adsorbed by different adsorbents, there is, nevertheless, a certain regularity depending upon the general character of these groups. Thus among hydrocarbons there is a gradual increase in the heat of adsorption as one passes from the naphthene and the CH_4 series to aromatic compds. and from these to compds. with double unions. For example, the ratio of heat evolved in the adsorption of C_6H_6 and of C_6H_{14} by the same amt. of different adsorbents is for all adsorbents nearly the same. Similarly for all the adsorbents tried the heat effect of adsorption is greater for $CHCl_3$ than for CCl_4, for acetone than for AcOEt, for MeOH than for EtOH, and for the latter than for AmOH. Hence in each group of compds. the heat effect of adsorption may serve as an approx. measure of their residual energy. To variations in the amt. of residual energy may also be ascribed the variations in the velocities of esterification of different alcs. and in the heats of formation of Mg org. compds. This is illustrated with examples from the literature, showing that alcs. with a greater heat of adsorption also react more readily in these respects. The conception of residual energy may also serve to modify the Kekulé-Michaels theory about the formation of intermediate addition products in every chem. reaction. Instead of assuming the formation in each case of a definite addition compd., it may be preferable to limit oneself to the more general assumption that each reaction is preceded by a more intimate contact of the interacting mols. brought about by their residual energies. Such a modification of the theory may account for the variation in the velocity of formation of Et_4NI from Et_3N and EtI with the nature of the solvent in which the reaction takes place (Menshutkin, *Z. physik. Chem.* **6**, 43) and for the influence of porous substances on the velocity of many reactions, *e. g.*, sulfonation in presence of infusorial earth. Another phenomenon intimately connected with residual energy is the following: When floridin is thrown into different liquids it falls to the bottom in some of them, leaving the supernatant layer almost transparent, while in others a strong turbidity appears at once. Sepg. the finely divided suspended portion and comparing its wt. with the total amt. of floridin used, the % or "degree of pulverization" caused by different liquids is found to vary in the same manner as the heats of their adsorption by floridin. This holds good for all the liquids tried (except amylene, cf. following abstr.). Herein G. sees a direct conversion of chem. into mechan. energy. The pulverization of a part of an insol. substance by the above method is analogous to soln., visible particles being torn away

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from the mass of substance in the 1st case, while in the 2nd the particles are invisible mols. The analogy is enhanced by the fact that the solvent powers of different liquids for a given substance vary as their residual energies in their adsorption by floridin. This is shown by a comparison of the relative solubilities of BzOH, *p*-$C_6H_4(NO_2)Cl$ and Me_3N in various liquids with the heat effects of their adsorption by floridin. The consts. of the inner compression of liquids (Tammann, *Innere Kraefte d. Loesungen*, 89), their heats of vaporization and their surface tensions are also found to run parallel to their residual energies. The latter also influence the vol. changes accompanying the mixing of 2 liquids (Biron, *C. A.* **5**, 610), these changes being the smaller the nearer to each other the values of the heats of adsorption of the components. The wide range of influence of residual energy seems to show that no interaction whatever between mols. may be regarded as a purely phys. process. The specificity of the phys.-chem. attractive force differs from the specificity of purely phys. forces like magnetic or elec. attraction in that the latter 2, though also not perfectly universal, depending as they do on magnetic permeability and the dielec. const., resp., can nevertheless be expressed as simple functions of the latter, while residual energy, like chem. affinity, cannot be so simply expressed. From chem. affinity which is active only at at. or at most at mol. distances, the phys.-chem. force differs in being active at considerably greater distances. This was proved by detg. the thickness of the layers of CCl_4 and CS_2 adsorbed by Ag foil and by glass wool (cf. *Phil. Mag.* **5**, 517(1903)). Though data are lacking in support of this point, it is supposed that not only with liquids but with all substances the sphere of action of the residual energy extends considerably further than the adjacent mols. The phys.-chem. force also differs from chem. affinity in that it is greater between similar than between dissimilar substances. This is shown by the evoln. of more heat in the adsorption of hydrocarbons by C than by the entirely dissimilar floridin or Al_2O_3. In respect to soln. the principle "*Similia similibus solvuntur*" has long been known, and since soln. is only a special case of the activity of residual energy, the general principle "*Similia similibus attrahuntur*" may be set up for the phys.-chem. attractive force. The relation of residual energy to purely phys. and purely chem. forces G. summarizes as follows: Of the total amt. of energy in atoms, that part which acts within atomic distances according to valence is purely chem. and is a function of the degree of dissimilarity depending upon elec. charges. Residual energy is what is left of the original amt. of energy after the formation of elec. neutral mols.; its sphere of action extends further than that of the chem. force, and it is a function of the degree of dissimilarity of substances. To its influence are due the formation of colloids and compds. like Purple of Cassius and the various phenomena mentioned above. The purely phys. attractive force acts at a still greater distance and is entirely independent of the similarity or dissimilarity of substances. H. M. GORDIN.

Action of floridin on unsaturated compounds. L. G. GURVICH. *J. Russ. Phys. Chem. Soc.* **47**, 827–30(1915).—When floridin which has been used for decolorizing naphtha oils is extd. with Et_2O, the latter distd. off and the residue mixed with the original oil, the product has a much darker color than it had before the treatment with floridin. This was ascribed to polymerization by the floridin of the unsatd. compds. of the oil (Gurvich, *Wissenschaftliche Grundlagen d. Erdoelbearbeitung*, 232, Berlin, 1912). This polymerizing effect of floridin on unsatd. compds. is now corroborated by the following expts.: When amylene is treated with floridin the mixt. becomes hot and the product contains 15–85% of diamylene, according to the length of digestion. With terpene floridin reacts so violently that the mixt. boils furiously, and the product contains camphene and probably dipentene, sesquiterpenes and polyterpenes. The polymerization of amylene and terpene is doubtless due to the tremendous compression caused by their adsorption by the floridin, while the isomerization of terpene

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is probably due to the high temp. Other adsorbents have no such effect. That the action of floridin is not due to the O condensed on its surface is shown by the fact that calcination does not diminish its activity. To this specific polymerizing effect of floridin on unsatd. compds. is due the exceptional behavior of amylene in the reaction of pulverization (cf. preceding abstr.). H. M. GORDIN.

The density of oxygen. A. F. O. GERMANN. Western Reserve Univ. *J. Phys. Chem.* 19, 437–77(1915).—This is substantially a translation of a previous publication in French (see *J. chim. phys.* 12, 66–108(1914); *C. A.* 8, 599). The author has included a historical survey of the detns. of the density of O, and has given a complete description of the manipulative details used, besides adding several drawings. The experimental data are the same as those previously published. A. F. O. G.

Solubility of hydrogen in the solid alloys of palladium with gold, silver and platinum. A. SIEVERTS, E. JURISCH AND A. METZ. Leipzig. *Z. anorg. allgem. Chem.* 92, 322–62(1915).—The method used was the same as used in previous work by S. (*C. A.* 8, 297), with additional precautions to ensure accuracy. The alloys were studied from 138 to 820°, and with H pressures of one atm. and less. The velocity of the absorption and the relation between gas pressure and amt. absorbed are the same as with pure metals. For all 3 series of alloys the amt. of H absorbed per g. alloy is approx. proportional to $\sqrt{P_H}$ and, with the exception of alloys rich in Pt, at const. pressure decreases with increasing temp. With increasing amts. of Pt the amt. of H absorbed decreases at all temps., probably reaching a minimum in the interval 50–100% Pt. The higher the temp. the smaller the relative soly. lowering with const. Pt increments; at constant temp. this lowering is smaller than proportional to the Pt content. At all temps., addition of Ag to Pd increases the soly. of H in Pd, until a max. is reached at 40% Ag, after which the soly. falls off rapidly, the effect passing through zero between 50 and 70% Ag. The soly. max. obtained with 40–50% Ag increases with decreasing temp. from 800 to 270°, then decreases. Addition of Au to Pd has an effect similar to a Ag addition, although not so pronounced. At 827° the soly. of H is diminished by addition of Au; at other temps. it increases to a max., then diminishes. The Au concn. corresponding to the max. soly. decreases with increasing temp. Between 830 and 220° a given Au content results in a greater increase in soly. the lower the temp.; below 220° the relative soly. increase probably diminishes. The curves showing the variation of various physical properties with compn. in each of the binary Pd-metal systems show marked similarities with the curves of H absorption in that system. The Au and Ag alloys are marked by a high solvent power for H as well as by unusual electrical properties. All the evidence points to the formation of true ternary solid solns. between H and the binary alloys. GEORGE W. MOREY.

Isotherm of solubility at 25° of lithium chloride in mixtures of water and ethyl alcohol. II. S. PINA DE RUBIES. Madrid. *Anales soc. espaü. fis. quim.* 12, 343–9 (1914).—P. has extended his previous work on this subject (*C. A.* 9, 743). The solubility curve was found to be linear from the point 100% H_2O to approx. the point 30% H_2O + 70% EtOH; the molecular solubility curve presented a minimum in the zone corresponding to the soln. 40% H_2O + 60% EtOH. The salt $LiCl.H_2O$ is at practically all points of the curve; the anhydrous salt is deposited at the point 100% EtOH. Figures showing the equil. of LiCl in 100 g. of soln. as well as the molecular curve of equil. are given. H. S. PAINE.

Thermal properties of carbonic acid at low temperatures. II. C. F. JENKIN AND D. R. PYE. *Trans. Roy. Soc. London* (*A*) 215, 353–81(1915); cf. *C. A.* 8, 3744. —In this paper further expts. on the total heat of commercial CO_2 have been described; the same app. and general method were employed as before. A new calorimeter has

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been added and several details have been improved. The total heat of CO_2 gas and liquid CO_2 have been detd., and throttling expts. have been made on the superheated gas. In a throttling expt. gas flows through a valve while the temp. and pressure are measured on each side of the valve. Data so obtained can be combined with that from a single const.-pressure curve and used to plot all the other pressure curves in the superheated area, and the gas-limit curve. The data are shown in tables and charts which cannot be presented in a brief abstract. E. B. MILLARD.

Saponification of esters by alkalies, especially of ethyl phthalate. RUD. WEGSCHEIDER AND WALTER V. AMANN. Univ. Vienna. *Monatsh.* 36, 549–610(1915).—The literature of the theory of sapon. of esters by alkalies in aq. and alc. solns. is critically reviewed. It is shown that, in the formulation of the activity of alc. NaOH in kinetic expts., the equil. between NaOH and NaOA, where A is an alkyl, need not be considered as long as the ratio of the concn. of the alc. and H_2O is const. One can consider the ions $(OH)'$ and $(OA)'$ and the undissociated mols. NaOH and NaOA as the parts reacting and calc. the reaction accordingly. The sapon. of Na phthalate by a soln. of Na in 96.4% alc. (by wt.) proceeded in some cases as if it were a trimol. reaction; the const. depended, however, upon the initial concn., which proves the inadmissibility of this formulation. This apparent trimol. reaction, up to 0.2 *N* concns. of alk., proves to be a reaction between undissociated Na phthalate and undissociated NaOEt and is of the 1st order as regards the 2 mols. Ostwald's diln. law may be applied to the alc. NaOH soln. and the dissociation const. be considered as 0.02. Further the change in dissociation of the EtONa caused by the dissolved salts is to be considered. Thus the equation of the velocity of reaction assumes different forms depending upon whether the salts remain in soln. or not. At 25° dx/dt = 0.053 (NaOH + NaOEt) ($C_6H_4CO_2NaCO_2Et$) (time in min., concn. in mol./l.). The question as to how far this may be extended to monobasic esters is discussed. With yet higher Na content the marked rise of the bimol. const., calcd. in the ordinary way, with the alkali content, cannot be harmonized with this supposition. Thus it is not possible, in this case, to relate the so-called neutral salt action with the dissociation behavior and reactivity of the undissociated mol. The sapon. of di-Et phthalate by EtONa proceeds in steps, retaining the same suppositions made for the sapon. of the acid ester. The ratios of the real sapon. consts. deviate in general from 2 to 1, yet show a certain closeness to this value. It is a question how far the older work on the sapon. of the esters of dibasic acids has considered these suppositions. C. J. WEST.

Sulfonation of hydroquinone. J. PINNOW. *Z. Elektrochem.* 21, 380–8(1915).—Fine, dry $C_6H_4(OH)_2$ was heated with an excess of H_2SO_4 of various concns. at 100°, and samples withdrawn and extd. at intervals. The reaction is monomol. If time was taken from the moment when the hydroquinone was completely dissolved (generally 1.5 to 2 min. after adding the acid) the first const. calcd. was too high. Since local concn. differences could not explain this, it was suggested that perhaps the solid $C_6H_4(OH)_2$ was bimol., and, therefore, caused a rapid reaction before it could dissociate into single mols. If the H_2SO_4 is not stronger than c = 13 and if the formation of a disulfonate is avoided, the sulfonation of $C_6H_4(OH)_2$ is a monomol. and irreversible process when there is a sufficient excess of H_2SO_4. The decompn. of the sulfonate is not caused by the ions or the undissociated mols. of H_2SO_4, for only that part of the acid which is present as monohydrate or dihydrate is capable of hydrolyzing $(HO)_2C_6H_3SO_3H$. Also in the equil. expression: $(HO)_2C_6H_4 + H_2SO_4 \rightleftharpoons (HO)_2C_6H_3SO_3H + H_2O$, the *total* H_2SO_4 cannot be considered, for only the monohydrate is capable of introducing the first sulfo group; and for the introduction of the second group only the unhydrated acid is effective, and this above 100°. Since the H_2O produced in the reaction greatly retards the reaction, and since an excess of H_2SO_4 aids the formation of the disulfonate,

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the monosulfonate is best prepd. *in vacuo* with a small excess of acid. The disulfonate is only slowly decompd. at 100°. E. B. MILLARD.

Equilibria of hydrogenation. M. PADOA AND B. FORESTI. *Atti accad. Lincei* 24, I, 946–54(1915).—In a preceding paper (*C. A.* 9, 736) P. and F. studied the equilibria $3Me_2CHOH + C_6H_6 \longrightarrow C_6H_{12} + 3Me_2CO$ and $Me_2CHOH + Et_2CO \longrightarrow Et_2CHOH + Me_2CO$ and compared the consts. obtained with those calcd. theoretically; the agreement was good. The chem. consts. could also have been calcd. from the formulas proposed by Nernst: (1) $\log p = (-\lambda_0/4.571T) + 1.75 \log T + (\epsilon T/4.571) + C$ and (2) $\lambda = (\lambda_0 + 3.5T - \epsilon T_2)(1 - (P_0/\pi_0))$ where ϵ is the difference of the mol. cals. of the gas and of the condensate at abs. zero, p is the vapor tension of the substance at the abs. temp. T, λ_0 the heat of vaporization at abs. zero, π_0 the critical pressure, and λ the heat of vaporization at the temp. T. Since the critical pressure and heats of vaporization of some of the compds. were not known this method of calcn. could not be used. Recently Grassi (*C. A.* 8, 3641) detd. these values for Et_2CO and Me_2CHOH and P. and F. calc. the other values on the basis of analogy according to Trouton's formula. The equil. consts. were then calcd. on the basis of these values and the above formulas but varied widely from the values experimentally obtained. These observations confirm the idea that the calcn. of chem. consts. is not possible on the basis of the formulas here given. E. J. WITZEMANN.

Kinetics of the reaction of alcoholic hydrochloric acid with phthalic acid and its esters. RUD. WEGSCHEIDER AND WALTER V. AMANN. Univ. Vienna. *Monatsh.* 36, 683–717(1915); cf. preceding abstr.—The literature of the theory of ester formation from acid and alc. in the presence or absence of HCl is critically discussed. The velocity of the formation of EtCl from HCl and EtOH containing 3.6% (by wt.) of H_2O is, with a considerable HCl content, about proportional to the square of the HCl concn. In cases where this formula does not hold, there is introduced a term proportional to the 1st power of this concn. The velocity cannot be calcd. on the assumption that it is proportional to the concn. of the undissociated HCl mol. While this reaction may be considered as being accelerated by HCl, the opposite reaction is not catalytically accelerated by HCl. In the reaction between phthalic acid and its Et esters with EtOH (containing 3.6% H_2O) and HCl, the change in the HCl content between 25° and 60° can be related to the reaction between HCl and the alc. A direct sapon. of the ester by HCl with the formation of EtCl does not take place to any considerable extent. Of the sapon. reactions only that of the neutral ester by H_2O is noticeable. That of the acid ester is very small. The esterification of phthalic acid can be considered as a step-wise reaction. The const. of the step, acid to ester acid, is very much greater than that of the ester acid to the neutral ester, but considerably less than that of BzOH. From this the following behavior of dil. EtOH-HCl upon phthalic acid follows: phthalic acid goes over into the ester acid in such time that about $^1/_3$ is completely esterified to the neutral ester. Then the esterification of the neutral ester reaches an equil. detd. by the sapon. of the neutral ester by H_2O. About 10% of the acid is then present as ester acid. Since the HCl reacts with the alc. to give EtCl and H_2O, more of the neutral ester is sapond., which continues until an equil. is reached from the EtCl. Many equations are given. C. J. WEST.

Thermodynamics of the sulfuryl chloride equilibrium. IV. Velocity of the reaction approaching equilibrium. MAX TRAUTZ. *Z. Elektrochem.* 21, 329–42(1915); cf. *C. A.* 7, 10.—The reaction $SO_2 + Cl_2 \rightleftarrows SO_2Cl_2$ in the dark cannot be considered as a pure gaseous reaction. Only on the addition of animal charcoal as a catalyzer were easily reproducible velocity measurements obtained; then both reactions proceeded as adsorption processes in which the velocity of diffusion did not appreciably interfere. In both cases the reaction is approx. normal, though more so in the de-

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compn. than in the formation of SO_2Cl_2. In the latter case the reaction consts. decreased more rapidly, corresponding to a lower order of reaction (adsorption). The temp. coeff. of formation is about 1, that of the decompn. about 1.5, though both values are too small on account of the slower temp. effect of adsorption. The formation of SO_2Cl_2 from SO_2 and Cl_2 in glass vessels under the light of a quartz lamp at $T = 291$ and $T = 372°$ (abs.) at various concns. has been studied. The reaction, especially at the higher temp., proceeds smoothly as a 2nd order reaction; the consts. at the higher temp. are without variation. In the light, SO_2Cl_2 is not the only product of the reaction; if the relatively small periods of illumination are sepd. by several hours of darkness, other substances are formed which cause a decrease in the velocity const. of the reaction. When const. illumination was employed, consts. were no longer obtained, probably on account of the other products of the reaction. A temp. increase of 80° decreased the velocity of formation corresponding to a temp. coeff. of 0.88 for each 10°. The velocity of the formation-reaction is of the same order as that which is catalyzed by animal charcoal in the dark, whether "Uviol" light or that from a quartz lamp is used. The formation of SO_2Br_2 from SO_2 and Br_2 in the light of a Nernst lamp or in the dark, between 106° and 202° in glass vessels without a catalyzer, could not be accomplished. But $COBr_2$ could be readily formed from CO and Br vapor, an equil. being quickly reached which corresponded to a very large dissociation of the $COBr_2$. From the equil. consts. at 73° and 181° the heat of formation was calcd. as about 3000 cal. E. B. Millard.

Electrical conductivity and dissociation in solvents with dielectric constants up to 13. A. N. Sakhanov and Ya. S. Przheborovskii. **From 13 to 80.** A. N. Sakhanov and A. I. Rabinovich. *J. Russ. Phys. Chem. Soc.* 47, 849–70(1915).—The object of the work was to det. the changes in mol. cond. and particularly the displacement of its minimum when the dielec. const. of the solvent varies from a small value up to that of H_2O. The electrolyte was $AgNO_3$, and the solvents were aniline, pyridine, quinoline, *m*-chloroaniline, acetonitrile, H_2O and their various mixts. whose dielec. consts. were found by calcn. from the values of the consts. of the components. In this way a series of solvents was obtained whose dielec. consts. varied from 6.85 to 80. The influence of the changes in viscosity on the cond. was eliminated by detg. the coeff. of inner friction of the solns. and correcting the data so as to obtain the conds. which the solns. would show if the viscosities would not change with conc. Whether such corrections are admissible for very concd. solns. in which the transport of ions is possibly not in direct proportion to viscosity will be detd. later. All measurements were made at 25°. The results given in numerous tables and curves may thus be summarized. The mol. cond. curves of $AgNO_3$ solns. show minima or maxima according to the values of the dielec. const. The cond. values, corrected for changes in viscosity in solvents with dielec. consts. above 8, give typical curves with minima. The position of the minima only corresponds to Walden's formula when the cond. is corrected for changes in viscosity, and even then only for dielec. consts. not exceeding 35. The position of the maxima varies within wide limits. The relation between the changes in viscosity and mol. cond. in very concd. solns. shows that, contrary to the accepted opinion, salts of the $AgNO_3$ type are already ionized in the individual condition (amt. of solvent zero), so that soln. merely displaces the equil. between the undissociated mols. and the already existing ions according to the value of the dielec. const. of the solvent and the changes in the elec. affinities of the ions caused by solvatation. A more detailed elaboration of this hypothesis is promised for the near future. H. M. Gordin.

The conductivity of mixtures of solid salts. C. Sandonnini. Univ. Padoa. *Atti accad. Lincei* 24, I, 842–9(1915).—Benrath (*C. A.* 3, 610) and B. and Wainoff

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(*C. A.* 6, 176) found in a study of the cond. of binary systems of solidified salts that pairs of salts which give solid solns. have a cond. curve which shows a max., and since binary alloys show the reverse he concluded that this is a characteristic of conductors of the 2nd class as compared with the 1st class. B. and W. also found when neither solid solns. nor compds. are formed the cond. is about that calc. additively except at the eutectic point where there is still considerable variation. In a preceding paper (cf. *C. A.* 9, 2834) the conds. of $PbCl_2$-$PbBr_2$, AgCl-AgBr and AgCl-TlCl in the fused state were detd. S. has now studied the conds. of the same systems in the solid state. The method of Benrath and LeBlanc for detg. the cond. was used. The fused mixt. was aspirated into a glass tube of known diam. The cylinders were reduced to a comparable length according to the cond. of the material, and Ag or Pt foil was pressed onto the ends in order to make good elec. contacts. The heating was done in an elec. furnace in a N_2 atm. and the temp. controlled with a Pt-Pt+Rh couple. From the solidification diagrams it has been shown that the system $PbCl_2$-$PbBr_2$ forms mixed crystals of the 1st type; the system AgCl–AgBr mixed crystals of the 2nd type; the system AgCl–TlCl gives a compd. 2TlCl.AgCl which decomposes on fusion. The cond. of solidified mixts. of $PbBr_2$-$PbCl_2$ detd. at 200°, 250° and 300° showed a minimum for each isotherm corresponding approx. to an equimol. mixt. In the system AgBr–AgCl cond. measurements were made at 200°, 250°, 300°, 350° and 400°. The cond. values for mixts. containing 0 to 70 mol. % AgBr are lower than the values calcd. by the rule of mixts. and those above 70 mol. % are a little higher than the calcd. values. At the lower temps. there is a sharp break in mixts. with 70 mol. % AgBr corresponding to the minimum pt. in the temp. of crystn. In the system AgCl–TlCl the cond. measurements were made only at 200° since the eutectic lies at 210°. The cond. isotherm passes through a max. corresponding to the eutectic concn. (40 mol. % TlCl). The numerical data are plotted and discussed in detail. In general it is concluded that when the solidified mixt. of salts is composed of solid solns. that are perfectly homogeneous and their solidification ps., as in the system $PbCl_2$-$PbBr_2$, lie intermediate between those of the pure components, the phenomena found with mixts. of solns. or fused masses of salts having a common ion are observed. The cond. is lower than that calcd. additively. When, however, the mixts. are composed of mechanical mixts. of components the phenomena peculiar to mixts. of solns. or fused salts do not hold true. If no other phenomena intervene their cond. may be calcd. additively. In the system AgCl–TlCl a max. was observed that coincides with the eutectic concn. The formation of solid solns. is absolutely excluded. The presence of a double salt ought to cause a decrease and not an increase in cond. S. considers that this max. may be accounted for by decrease in internal friction owing to the fact that this max. was observed at a point at which the cond. isotherm lay close to the solidification p. eutectic. S. concludes that the cond. of solidified fused salts depends to a marked extent on the internal friction of the mixt. as well as on the constitution. The internal friction will be of more significance the closer the m. p. is approached.

E. J. Witzemann.

The temperature coefficient of the free surface energy of liquids at temperatures from —80° to 1650°. IX. The surface energy of homologous aliphatic amines. F. M. Jaeger and Jul. Kahn. Groningen. *Proc. Akad. Wetenschappen* 18, 75–91 (1915).—The free surface energy and its temp. coeff. were previously observed to be small for organic derivs. of trivalent N; consequently a systematic study of the aliphatic amines was undertaken by the methods previously described (*C. A.* 9, 2024). The substances investigated were $MeNH_2$, Me_2NH, Me_3N, $EtNH_2$, Et_2NH, Et_3N, *n*-$PrNH_2$, *n*-Pr_2NH, *n*-Pr_3N, *i*-$PrNH_2$, *i*-Pr_2NH, *i*-Pr_3N, $C_5H_5NH_2$, *n*-$BuNH_2$, *i*-$BuNH_2$, *i*-Bu_2NH, Bu_3N, Me_3CNH_2, *n*-$C_5H_{11}NH_2$, *i*-$C_5H_{11}NH_2$, $(Me_2CHCH_2CH_2)_2NH$,

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Me_2EtCNH_2, $C_6H_{13}NH_2$, $Me_2CH(CH_2)_2NH_2$, n-$C_7H_{15}NH_2$, $HCONH_2$. All were dried over Na or K, and fractionated *in vacuo* over KOH. Sp. gr. detns. were all made with a volumeter because of the tendency of the amines to take up CO_2 and H_2O from the air. The results obtained are given in tables and the values of μ (mol. surface energy) are plotted against t. The following generalizations were made. Substitution of H atoms in the NH_3 mol. by hydrocarbon radicals results in a regular increase in the surface energy at const. temp., the increase in general being parallel to the augmentation in the number of C and H atoms. Exceptions are sometimes caused by the specific effect of the configuration of the mol., normal chains generally possessing a greater surface energy than ramified chains. Values found for $d\mu/dt$ were rather small, the smallest values being found with the primary amines, while those with secondary amines are somewhat greater and those with tertiary amines approach the values found with other C compds. Also, the increase in the surface energy is greater with an unsatd. substituting radical than with a satd. one.

GEORGE W. MOREY.

Ebullioscopic behavior of solvents at different pressures. E. BECKMANN AND O. LIESCHE. Berlin-Dahlem. *Z. physik. Chem.* 90, 129–38(1915); cf. *C. A.* 9, 746.—The error occasioned by the pressure increase, due to the elevation of the boiling liquid column on the addition of a substance is discussed. It is found that this error approaches the theoretical value at low pressures. In ebullioscopic const. and mol. wt. detns., this error is not sufficiently great to necessitate the introduction of corrections.

H. JERMAIN CREIGHTON.

An hypothesis concerning the condition of dissolved electrolytes. II. H. C. S. SNETHLAGE. Univ. Groningen. *Z. physik. Chem.* 90, 139–88(1915); cf. *C. A.* 9, 2340.—Investigation of the behavior of electrolytes in aq. soln. shows that, as in the case of alc. solns., they may be divided into 2 great groups. The first of these embraces solns. of the strong electrolytes of the type KCl, HNO_3 and NaOH. In the case of these electrolytes, positive exptl. evidence has been obtained to the effect that different important properties such as the catalytic and chem. non-catalytic action of the strong acids and bases, light absorption of salts, heat of neutralization and f. p. depression of acids and bases, when calcd. per mol., are independent of the concn. For the cond. of all electrolytes and the f. p. lowering of salts, this independence has not been observed. The change of the quant. expression for these properties with concn. can best be explained on the assumption that the degree of dissociation does not change. The proportionality between effect and concn. makes its appearance only below definite limits of concn. These limits are different for the same electrolyte in the case of different phenomena, and also different for different electrolytes in the case of the same phenomenon. The mol. effect of electrolytes with a mutual ion in reference to properties, into which this ion enters, is in general not the same. These differences must be attributed to the non-mutual ions. It is pointed out that the sequence of the mols. of different electrolytes with a mutual ion is always detd. in the same manner by the non-mutual ion, in the case of different phenomena. This sequence is that of the ions in the electromotive series. It is shown that the ratio, Λ_ν/Λ_A (where the index A-refers to the active mols.), which is one of the many expressions for the strength of an electrolyte, is of no particular importance in the calcn. of the properties of an electrolytic soln. In this respect, the present hypothesis approximates the dissociation hypothesis. According to the latter, the difference in the strengths of solns. of electrolytes with a mutual ion is attributable to the difference in the degree of dissociation, Λ_ν/Λ_A; while according to the former hypothesis, although the foregoing ratio is an expression of the strength, it is not a direct measure. It is a function of the value which is to be regarded as the true measure of the strength of the electrolyte, namely

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Λ_A. The greater Λ_A, the greater the catalytic action of the electrolyte, and the greater Λ_v/Λ_A for the same concn. Concd. solns. of electrolytes of the 1st group are somewhat less uniform in their behavior, but nevertheless their behavior is in good agreement with the hypothesis evolved in this paper. The mol. activity decreases in some cases (cond. and f. p. lowering of salts) with increasing concn., while in other cases (catalytic and chem. non-catalytic activity of salts) it increases. The present hypothesis assumes that the change of mol. activity is linearly proportional to the mean distance between the mols. ($ac^{1/3}$), where c is the net concn. and a is a const. In order to explain the different phenomena observed with solns. of the 1st group, the following suppositions are discussed at length and differentiated: (1) The strong electrolytes have collectively the degree of dissociation 1, which is independent of the concn.; (2) to a large extent they are not dissociated into independent ions, their activity being due to the presence of active mols.; they have a degree of dissoc. which lies between 0 and 1, but which is independent of the concn. The 2nd group of electrolytes embraces the majority of org. acids, probably also the bases, perhaps NH_3, H_2SO_4 and similar substances. The properties of solns. of these substances can be calcd. on the assumption that there are 2 kinds of mols. The 1st kind, which exhibits catalytic and elec. activity, is not markedly differentiated from the mols. of electrolytes of the 1st group. The transition of one mol. variety into the other is not to be regarded as a dissociation, but as an activation. The 2nd mol. variety exhibits the same properties as the active mols., but in a lesser degree. For the 1st variety the name "preactive" mols. has been proposed. If the elec. activity of the preactive mols. is not too great, the ratio Λ_v/Λ_A gives an approx. measure of the degree of dissociation ($\Lambda_A = \Lambda_\infty$). The elec. activity of the preactive mols. is designated with Λ_P, and their catalytic activity with k_P. Between both mol. varieties there exists an equil. which is displaced as the concn. changes, and the const. which governs this equil. is the affinity or activity const. While the law of mass action has been found to have no application to the 1st group of electrolytes, it may be applied to electrolytes of the 2nd group. There exists between both groups, however, such a gradual transition that the strongest electrolytes of the 2nd group are but slightly differentiated from those of the 1st. The ratio between the activity of the preactive and the active mols. of an electrolyte is a characteristic quantity, at least so long as only the elec., or only the catalytic activity is compared. The value of this ratio is always greater for a stronger than for a weaker electrolyte. Since the elec. activity of the active mols. of different electrolytes, as well as the catalytic activity when one and the same reaction is considered, is approx. the same, it follows that the sequence of the activity consts. is that of the activity of the preactive mols. The action of solns. of such electrolytes is made up of 2 additive factors. If γ represents the degree of dissociation, then $\Lambda_v = \gamma\Lambda_A + (1 - \gamma)\Lambda_P$ and $k_v = \gamma k_A + (1 - \gamma)\Lambda_P$. Since the equil. between the 2 kinds of mols. is governed by the law of mass action, there is obtained, when $k_P/k_A = f$ and $\Lambda_P/\Lambda_A = r$, the expression: $((\Lambda_v/\Lambda_A) - r)^2/[(1 - r)(1 - (\Lambda_v/\Lambda_A))v] = K = ((k_v/k_A) - f)^2/[(1 - f)\cdot(1 - (k_v/k_A))v]$ where K denotes the corr. affinity const. The applicability of this formula is illustrated. In conclusion, certain objections to the supposition of the existence of preactive mols. are considered. H. Jermain Creighton.

Electromotive forces due to the simultaneous movement of an electrode and the electrolyte. St. Procopiu. *Bull. acad. sci. Roumanie* 3, 187–98(1915); *Chem. Zentr.* 1915, I, 1041.—The electrodes were wires projecting from glass tubes into a stirred soln. of the electrolyte (or distd. H_2O) of definite concn. If 1 of 2 such identical electrodes is moved, an e. m. f. is generated, of such sign that Hg, Ag, Cu and Ni are negative during the movement, Pb, Al, Fe and Zn positive. The e. m. f. series of the metals is the same as that of Nernst, with the exception of Pb and Ni. From expts.

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by P. on the e. m. f. of these (not wholly pure) metals, the positions of Pb and Ni are the same as in the series for moving electrodes. All metals whose soln. pressures are smaller than that of H are negative, and all with greater soln. pressures are positive. The formation of an electrical double layer was suggested as a possible cause of the e. m. fs. produced. E. B. MILLARD.

Kinetic theory of the phenomenon of galvanic polarization of galvanic cells; especially the polarization electromotive force of magnetization. E. GAICU. *Bull. acad. sci. Roumanie* 3, 171–86(1915); *Chem. Zentr.* 1915, I, 1044.—Between 2 electrodes of ferromagnetic material, one of which is magnetized, there is an e. m. f. such that the magnetized pole is positive. The expts. of Hurmuzescu (*Arch. sci. phys. nat.* 5(1898)) have been extended, using $FeCl_3$ as the electrolyte in place of $(COOH)_2$. The smaller the concn. of the soln., the greater the e. m. f. obtained. It decreases with lapse of time, which G. explains as due to the collection of ions on the electrode, or polarization. The collection of these ions is due to a kind of destructive action on account of heat movement of the ions. For the e. m. f. of polarization, the formula given is $E_\phi = E_0(1 - e^{-(g/CT)(\epsilon/m)t})$, where E_0 is the e. m. f. free from polarization, e and m the charge and mass of the ion, T the abs. temp., C the concn. of the soln., t the time, and g a const. dependent on the nature of the ion. The formula agrees fairly well with the results. E. B. MILLARD.

Photochemical reactions in mixtures of ozone and hydrogen. FRITZ WEIGERT AND HANS BÖHM. Berlin and Leipzig. *Z. physik. Chem.* 90, 189–222(1915).—A quant. investigation has been made of the catalytic influence of ultraviolet rays on the simultaneously occurring ozone decompn. and the H_2O formation. The expt. method which permits the action of ultraviolet rays from a quartz lamp to act on mixts. of H and ozonized O in variable proportions, is described. The radiations had to pass through so long a layer of gas that, even with small ozone concns., all the effective light was absorbed. By the measurement of the vol. change of the illuminated gas, and by chem. analysis of the gas both before and after radiation, the extent of the participation of the H_2O formation and the ozone decompn. in the photochem. process has been ascertained. It has been found that in the dark no appreciable reaction between H and ozone takes place within an hour. During radiation the following processes occur simultaneously: (I) $2\ O_3 = 3\ O_2$ and (II) $H_2 + O_3 = H_2O + O_2$. The formation of H_2O_2 has not been observed. From a graphical consideration of the change in vol., which occurs when the contents of the reaction vessel are subjected to radiation, it is found that with a large H excess the contraction associated with H_2O formation (equation II) occurs, while with large ozone excess the dilatation associated with ozone decompn. (equation I) takes place. At the transition point out of every 3 O_3 mols. 2 decomp. in accordance with equation I and 1 in accordance with equation II. The photochem. decompn. of O_3 is a relatively slower process in the presence of H. It is, however, greatly accelerated by the presence of small quantities of H, but then within a large O_3 interval proceeds proportionally to the O_3 concn., and above 8% H is independent of the H concn. From the deviations of the curves from a straight line at the beginning and the end, it has been calcd. that the "order" of the O_3 decompn. is greater than 1 in expts. with a large H excess, and less than 1 in expts. with a large O_3 excess. It has been shown that the effect of two simultaneously occurring photochem. reactions cannot be regarded as the sum of the effects of the individual processes. In the presence of smaller O_3 concns., the photochem. H_2O formation proceeds proportionally to those concns., but approximates a limiting value at higher O_3 concns., this value being higher the greater the partial press. of the H. With const. O_3 concn., the H_2O formation is approx. proportional to the H concn. With about 100-fold H excess over the quantity which is necessary for the formation of H_2O in accordance with equation II, only this reaction takes place. H. JERMAIN CREIGHTON.

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The disturbances of photochemical gas reactions. FRITZ WEIGERT. Univ. Leipzig. *Z. physik. Chem.* 90, 223–35(1915); cf. preceding abstr.—Consideration of the preceding investigation leads W. to the conclusion that disturbances of photochem. gas reactions are probably much more frequent than generally is supposed, and that a revision of the results of previous work will lead to new photo-kinetic formulations. H. JERMAIN CREIGHTON.

The adsorption of fuchsin and acid fuchsin by charcoal. AE. B. D. FORTUYN. Univ. Leiden. *Z. physik. Chem.* 90, 236–42(1915); see *C. A.* 9, 2729. H. J. C.

The refraction and dispersion capacity of silicon in organic silicon compounds. A. BYGDÉN. Stockholm. *Z. physik. Chem.* 90, 243–52(1915).—The mol. refraction of a large number of organic Si compds. has been measured, and from the results obtained the at. refraction and at. dispersion of Si have been calcd. H. J. CREIGHTON.

Influence of electrolytes on the dissociating power of solvents. II. A. N. SAKHANOV AND P. I. GONCHAROV. *J. Russ. Phys. Chem. Soc.* 47, 1244–60(1915).—In a former article (*C. A.* 8, 2292) it was shown that the elec. cond. of a mixt. of electrolytes in solvents having small dielec. consts. is considerably higher than the calcd. value, while in H_2O it equals this value or is even lower. Hence the generally accepted explanation of the change in the cond. of one electrolyte through the addition of another as being due to a dissociation power of ions on undissociated mols. is untenable, since the change ought to be greatest in H_2O if this were so. Further, to prove the invalidity of this explanation, S. and G. show by numerous expts. that the concn. of Ag ions in a soln. of $AgNO_3$ in H_2O, instead of increasing, gradually diminishes with the addition of NH_4NO_3, $KClO_3$ or $LiClO_3$. Similarly the abs. value of the potential of the H electrode in HCl or AcOH decreases with the addition of increasing amts. of neutral salts, and this influence is greatest when the latter are hygroscopic (LiCl, $CaCl_2$). It seems that under the influence of such salts H becomes "nobler". This is possibly due to the fact that the electrolytic soln. tension of H changes with its state of hydration, the hygroscopic salts dehydrating it through the formation of solvates. This will be more thoroughly ellucidated in a subsequent article in which it will also be shown that the exceptional behavior of solvents with low dielec. consts. is due to formation of complexes by the electrolytes. The electrometric method used in this work was that of Goodwin (*Z. physik. Chem.* 13, 577). H. M. GORDIN.

Inner cone of the divided hydrocarbon flame. N. A. BUBNOV. *J. Russ. Phys. Chem. Soc.* 47, 1191–211(1915); see *C. A.* 9, 995. H. M. GORDIN.

Activation of hydrogen and oxygen by means of platinum. J. EGGERT. *Z. Elektrochem.* 21, 349–52(1915); cf. *C. A.* 8, 3142.—The mechanism of the catalysis was either (1) a continuous contact action of the Pt between the undissolved gas and the soln. clinging to the Pt film or (2) a discontinuous charge and discharge of gas depending on whether the catalyzing film was in the gas or the soln. A soln. of $Fe_2(SO_4)_3$ was covered with an atm. of H, and a Pt wire gauze was repeatedly dipped into the soln., then withdrawn, washed free from the soln., and inserted again. The amt. of H absorbed in 4 hrs. was 0.1 of that when the same expt. was performed without the washing, so that the main part of the reduction seemed to take place on the film of soln. adhering to the Pt when it was in the atm. of H. The max. velocity of reaction for both H and O with solns. capable of reacting with them was an effect of contact action of the Pt, when the Pt was simultaneously in the presence of undissolved gas and the soln., best in the form of a thin film over the Pt. H is capable of distributing itself between platinized Pt and an atm., and can take part in chem. reactions at places other than the place of adsorption. This was supposed to be intimately connected with the action of a gas electrode. Henry's law holds for the distribution of H as well as O be-

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tween platinized Pt and an atm. of the gas over a pressure range 0.25 to 4 atm. Electrolytically pptd. Pt and Pd possess nearly the same properties (of catalysis) as the corresponding Pt or Pd black, but the colloids have a somewhat greater activity on account of the increased surface exposed to the reacting substances. E. B. MILLARD.

Catalytic action of the walls of the vessel (on the decomposition of hydrogen peroxide). GEORG VON ELISSAFOFF. *Z. Elektrochem.* **21**, 352–6(1915).—Expts. have been made on the rate of decompn. of H_2O_2 at 25.5° in the presence of glass wool, Jena glass powder, $CuSO_4$, or two of these together, and on the adsorption of $CuSO_4$ by the glass powder. The acceleration of the decompn. by glass wool or sea sand was much increased by the presence of $CuSO_4$ or other heavy metal salts, and the course of the reaction in the presence of these catalyzers was practically that of a monomol. reaction. The adsorption of $CuSO_4$ (or Cu) by Jena glass powder followed the adsorption isotherm for small concns.; and satn. took place at higher concns. The velocity const. for the decompn. of H_2O_2 measured in the presence of glass wool and $CuSO_4$ was proportional to the amt. of $CuSO_4$ adsorbed by the glass wool, so that this velocity const. might be used to det. the amt. of a heavy metal salt adsorbed. Further work is promised. E. B. MILLARD.

Variation of catalytic power of saline and colloidal solutions with concentration. EMILE GIURGEA. *Bull. acad. sci. Roumanie* **2**, 216–9(1914); *J. Chem. Soc.* **108**, II, 330(1915).—The catalytic powers of very dil. solns. of Na_2CO_3, NH_4Cl, KCl, NaCl, NaOH, KOH, colloidal Hg and some colloidal medicinal prepns. have been detd. in several concns. by the rate of decompn. of H_2O_2. In the case of Na_2CO_3 and NH_4Cl a slight increase in concn. produced a large change in catalytic activity, which, with a further increase in concn., rapidly reached a max. The increase with concn. for NaCl and KCl is less pronounced, and a max. was not yet reached at 0.1 *N*. With colloidal metals the catalytic power increases slowly at first, and for additional increases in concn. the increase is much more rapid than in the case of salts. With KOH and NaOH the catalytic power increases rapidly to a max. at approx. 0.002 *N*, then falls off rapidly, and is very small with NaOH at 0.1 *N*. Cf. following abst. E. B. MILLARD.

Influence of alkalinity in the determination of the catalytic coefficient. EMILE GIURGEA. *Bull. acad. sci. Roumanie* **2**, 220–4(1914); *J. Chem. Soc.* **108**, II, 331(1915). —The alkalinity and catalytic power of a number of salts in 0.1 *N* soln. have been detd. The alkalinity was detd. by titration with H_2SO_4 and methyl orange, and the catalytic power by the action of the soln. on H_2O_2. It was found that there is no direct relation between the 2 quantities. The catalytic power of colloidal solns. of S was detd. by the same method, and this quantity was found to increase with the concn. of the colloid. The properties of colloidal S are discussed in connection with their medicinal uses, and in their connection with S mineral waters. E. B. MILLARD.

Velocity of solution of metals. I. Review of the literature. M. TZENTNERSHVER. *J. Russ. Phys. Chem. Soc.* **47**, 1064–86(1915).—Exhaustive review with complete bibliography of the subject. H. M. GORDIN.

The passivity of iron. A. SMITS. Amsterdam. *Chem. Weekblad* **12**, 676–94 (1915).—A general article, recapitulating the author's views on the passivity of Fe and its explanation by means of his theory of allotropy (cf. *C. A.* **8**, 1038). GEORGE W. MOREY.

Emission of corpuscles in chemical reactions. I. S. TANATAR AND E. BURKSER. *J. Russ. Phys. Chem. Soc.* **47**, 956–8(1915).—The object of the work was to exam. the phenomena of ionization of the air in chem. reactions. For this purpose various reactions were made to take place in a large vessel filled with air and containing a calibrated electroscope charged either + or —, while the reacting substances were placed in flat

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glass or quartz dishes introduced through an opening near the bottom of the vessel. The reactions chosen were of 2 kinds, 8 with and 17 without evolution of gas. The results, given in a long list, show that evolution of gas is not always accompanied by ionization of the air, and that the degree of ionization detd. with an electroscope charged positively is usually higher than when the charge is negative. It was also found that when ionization accompanies a reaction the interruption or retardation of the latter produces a drop in the ionization which, though fast in the beginning, only slowly continues, lasting sometimes nearly an hour. Hence in detg. the radioactivity of mineral water the detns. should be made 4–5 hrs. after collecting the samples.

H. M. GORDIN.

The total radiation from a gaseous explosion. W. M. THORNTON. *Phil. Mag.* 30, 383–4(1915).—A mechanical hypothesis. G. L. WENDT.

The quantum theory of radiation and the structure of the atom. N. BOHR. Univ. Manchester. *Phil. Mag.* 30, 394–415(1915); cf. *C. A.* 7, 3712; 8, 461, 1906.—A recapitulation. Einstein and de Haas's measurement of a rotational mechanical effect produced when an iron bar is magnetized (*Verh. deut. physik. Ges.* 17, 152(1915)) is taken as support of B.'s first assumption: that no radiation of energy need take place in a "stationary" state of an at. system even if the electrons are in motion relative to each other. Stark's measurements on the dissociation of the hydrogen spectral lines by an electrical field are shown to agree entirely with the mathematical development of B.'s theory. Other applications and criticisms are discussed, and assent is given to Kossel's interpretation of high-frequency spectra (*C. A.* 9, 1715). G. L. WENDT.

The entropy in solid substances and its relation to other physical quantities. STEFANO PAGLIANI. *Atti accad. Lincei* 24, I, 835–41(1915); *Gazz. chim. ital.* 45, II, 66–75(1915).—In a recent study on the entropy of condensed substances (solid or liquid) and on its variation in the change of the state of aggregation some results were obtained for solids that lead to some new relations between thermodynamics and the modern kinetic theory of sp. heats, as well as to new expressions for the calcn. of the number of oscillations in the mol. vibratory motion of solids. The values of the abs. entropy at the temp. of fusion of solids (simple and compound) for 26 elements for which experimental sp. heat data could be found were calcd. according to the formula $S = \int_0^T c_p/T dT$. In general, the entropy at the temp. of fusion tends to diminish with the increase of at. coeff., and this holds accurately for the single terms in the periodic system of elements when one classifies the metals and metalloids separately. A constant product is not obtained by multiplying the values for entropy by the corresponding at. coeff. Thus the statement of Tammann (*C. A.* 8, 609) that the entropy of a gram-atom of a metal before fusion is independent of the metal is not true. The modern atomistic doctrine has led to the detn. of the number of particles, of mols., that may be monoatomic or polyatomic, contained in a gram mol. of a substance (Avogadro no.). But Richarz, Magnus and Lindemann (*Z. Elektrochem.* 16(1910)) state that solid metals may be monoatomic. Now the number of such atoms existing in a unit mass of an element varies inversely with the at. coeff. Thus the diminution in the value of entropy of the units of mass in the same physical state with the increase of their atomic coeff. may be comprehended. Further, according to the electron theory the atoms in solids are rather close and little movable and yet may vibrate or arrange themselves in their positions of equil. and may emit corpuscles and electrons that circulate in the spaces between the neutral atoms and positive ions. The mass and chem. nature of these atoms and ions is different for different substances; the force exercized by the electrons varies for the different substances; and finally the mean kinetic energy of each corpuscle varies with the temp. Thus it seems that the entropy of the gram

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mol. mass will not be equal for all simple substances at the same temp. This is also shown by the values of entropy at —273°. Thus, in general, but especially in the metals forming a single group in the periodic system or related groups, the values of entropy at the temp. of fusion diminish with the increase in the at. coeff., *i. e.*, with diminution of the number of atoms in a unit of mass. A comprehensive expression for the relation between entropy and the at. no., the interatomic distance and characteristic of vibratory motion of atoms is possible by putting the preceding results in relation with the deduction of Planck and Einstein on the energy of intramol. rotation and of atom oscillation. Lindemann obtained the formula $\nu = K\sqrt{T/m}\ V^{2/3}$ for the frequency of atomic vibratory motion; K is the coeff. detd. empirically, T the abs. temp. of fusion, m the at. mass and V the at. vol. Or using d for density, it may also be expressed thus, $\nu = T^{1/2}d^{1/3}/m^{5/6}$. Thus the values of n, d and s/n were given and on the basis of the latter 3 groups of metals are distinguished: (1) the alk. metals for which $s/n = \pm 0.36$; (2) the 2nd, 3rd, 4th, 6th and primary series of the 8th group of the periodic system: $s/n = \pm 0.146$; (3) the 5th and secondary series of the 8th group: $s/n = \pm 0.22$. From these results and from the formula of Lindemann it is concluded that the entropy of simple solids at the m. p. is proportional to the frequency of atomic vibratory motion. Grüneisen (*Ann. Physik* 39(1912)) demonstrated that the entropy is a function of the ratio between frequency and temp. Thus the atomic frequency may be calcd. in different substances by multiplying the entropy by a proportional factor obtained by dividing the coeff. of the formula of Lindemann by the corresponding mean value of s/n. All atomic frequencies previously calcd. and those obtained by the author's method are given in a table and those of P. agree very well except in the cases of Pt, Au and S, which are discussed in detail. E. J. WITZEMANN.

Some new relations that serve for the calculation of the frequency of molecular vibratory motion in solids. STEFANO PAGLIANI. *Atti accad. Lincei* 24, I, 948–54 (1915); *Gass. chim. ital.* 45, II, 59–66(1915).—In the preceding abstract a method for calcg. the frequency of the mol. vibratory motion of an element in the solid state by means of the values of entropy at the m. p. was described and ν was calc. for 26 elements. Thus the entropy may be calcd. even when the experimental data required by Lindemann's formula, $\nu = k\sqrt{T/m}\ V^{2/3}$, are not available. Thus by applying the coeff. of metalloids $\nu = 1.6 \times 10^{12}$ for Cl and $\nu = 1.1 \times 10^{12}$ for Br are obtained. The values for Cl (1.6×10^{12}) and K (1.7×10^{12}) are confirmed by that for argon (1.3×10^{12}, Sackur (*Ann. Physik* 40(1913)) and those of Ramsay and Travers for Cl and K. By comparing the frequencies of the components of KCl, KBr, NaCl and NaI with those of the compds. it is seen that the sp. frequency of a binary compd. is obtained by multiplying the sum of the component frequencies by 4/3. For KCl Rubens and Hollnagel (*Phil. Mag.* 1910) found the frequency by the optical method as 4.48×10^{12} and P. obtained 4.4×10^{12} from the component frequencies; for KBr R. and H. found 3.6×10^{12} and P. 3.7×10^{12} (Lindemann's method gives 3.5×10^{12}); for KI R. and H. got 3.10×10^{12}, P. got 3.7×10^{12}; for NaCl R. and H. got 5.9×10^{12}, P. got 6.1×10^{12}. Thus P.'s formula $\nu/(\nu_1 + \nu_2) = 4/3$ holds for halogen salts. The values for other compds. were not established because the necessary data were lacking. The mean values calcd. by various methods are compared and discussed in detail and the conclusion reached that the values obtained by the various methods are in good agreement. Thus for the salts NaCl, KCl and KBr as for the elements the values of the frequency diminish with increase in the mol. coeff. as for the entropy. It is noted that the coeff. of proportionality in the relation between frequency and entropy is equal to that found for the halogens. The values for the frequency calcd. by means of entropy and those detd. directly by optical measurements are in good agreement. Thus the results of these 2 papers make evident new relations between the

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atomistic theory and thermodynamics on the 1 hand and the modern kinetic theory of sp. heats and the quantum hypothesis on the other. E. J. WITZEMANN.

The coefficient of expansion of sodium. EDGAR A. GRIFFITHS AND EZER GRIFFITHS. *Proc. Phys. Soc. London* **27**, 477–83(1915).—*Discussion* 483–4. The differences in expansions of a vol. of Na (about 250 cc.) and an equal vol. of glass were measured by differential weighing under oil at various temps. from 20 to 100°. The coeff. of expansion was found const. over this temp. range and equal to 0.000226. In changing from solid to liquid state there is an abrupt increase in vol. of 2.57%. d_{17} = 0.971. For molten Na at its f. p., d. = 0.930. These data have an important bearing on the modern theories of sp. ht. It is known that C_p, the at. ht. when the metal is free to expand, for Na rizes from 6.5 at 0° to 7.5 at 96°, and the limiting theoretical value of C_v, the at. ht. at const. vol., at high temps. is approx. 6. The relation between these coeffs. and a, the coeff. of cubical expansion, e the coeff. of volumetric elasticity, v = 1 / density, A = at. wt., and t = abs. temp., is as follows: $C_p - C_v = a^2evAt$. Using the best existing value for e, and the present data on a for solid Na at the m. p. (370.6°), $C_p - C_v$ = 0.70 is obtained as probably the max. possible value. Thus the value of C_v deduced from exptl. data exceeds the theoretical limit by at least 13%.
PAUL D. FOOTE.

Theory of aqueous vapors. K. YA. MOSTOVICH. *J. Russ. Phys. Chem. Soc.* **47**, 1144–59(1915).—The state of superheated steam differs more from the ideal than that of other easily compressible gases. Particularly is this difference to be noticed in respect to its sp. heat at const. pressure which, as shown by Knoblauch (*Mitteilungen ueber Forschungsarbeiten*, 1911, 108; cf. also *C. A.* **8**, 610) is a function of both temp. and pressure. To explain the exceptional behavior of H_2O vapor Nernst assumes that steam is a mixt. of H_2O and $(H_2O)_2$ mols., the relative proportions of which vary with the temp. and pressure. By a rather lengthy mathematical analaysis M. shows that from the value of the d. of steam at any pressure and temp. the value of the equil. const. K_p of the equation, $2H_2O \rightleftarrows (H_2O)_2$, can be calcd. For a given temp. the values of K_p for different pressures are: $K_p = px^2/(1 - x^2)$, in which x is the degree of dissociation and p the pressure. If d is the theoretical density of $(H_2O)_2$ as found from the equation: $d = p/RT$, and δ the observed density of the mixt. at this pressure, the value of x is: $x = (d - \delta)/\delta$. Using data from the literature, M. gives tables of his calcd. values of x and K_p for p = 1 atm. and p = 10 atms., and for temps. between 99.1° and 300°. Making use of the equation of the isochore: $\lg(px^2/(1 - x^2)) = a + b(T - T_s)$, in which for p = 1 atm., T_s is the (abs.) temp. of satn., a = 1.2014, and b = 0.0035, and assuming that up to 20 atms. a is const., the value of x within this temp. interval may be expressed by the equation: $x = \left[\frac{10^a + b(T - T_s)}{p + 10^a + b(T - T_s)}\right]^{1/2}$. Since in practice p hardly ever exceeds 20 atms., the last equation is convenient for calcg. the values of x for any temp. H. M. GORDIN.

Heat of solution in mixed solvents. S. TANATAR. *J. Russ. Phys. Chem. Soc.* **47**, 1279–86(1915).—With a view to detg. the additional amt. of the heat of soln. (A) of a substance in a mixed solvent as compared with the A of the same substance in either of the components of the solvent, T. detd. the A of several electrolytes and nonelectrolytes in H_2O, EtOH, MeOH and mixts. of H_2O with either of these alcs. Expts. were also made in order to det. whether A changes with the conc. of the solute in the mixed solvent. The results showed that the negative A in the mixed solvents increases with % of alc., reaching a max. between 24 and 30%, and that A is independent of the concn. of the solute. Since some of the solutes were nonelectrolytes (*e. g.*, $(NH_2)_2$-CO), the rise of A cannot be due to increased ionization, and since A does not increase with the concn. of the solute, it also cannot be due to a removal by the solute of some

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of the H_2O from the hydrates supposed to be formed by alcs. Besides, the negative amt. of A is frequently much greater than could be obtained by the total disruption of hydrate. Thus the positive heat of formation of the hydrate of EtOH, after making a correction for contraction, is only 0.856 Cal., while the increase of A for some substances in aq. alc. (33.83%) is —4 Cal. The true cause of the increase is probably formation of solvates or other complexes of solvents and solute or some cycle of exothermal reactions. H. M. GORDIN.

Spontaneous temperature variations in a gas. F. v. HAUER. *Ann. Physik* 47, 365–76(1915).—On account of the variations in velocity in the mols. of a gas, there will be, at times, parts of the gaseous space which, considered as a separate whole, are in temp. equil. at a temp. different from that of the gas. These instantaneous variations have been calcd. in this paper. E. B. MILLARD.

Measurements of the electrical conductivity of solutions. W. A. TAYLOR. *Science* 42, 388–90(1915).—Preliminary announcement of a detailed study to be reported later. The effects of different current sources were investigated, and a Vreeland oscillator was found to give a pure sine wave of uniform frequency which could be varied widely. Voltage effect, size and shape of electrodes, material and surface condition of the electrodes, frequency of the a. c., capacity of the cell as a condenser, valence of the ions, conc. and character of the electrolyte and solvent, use of inductance or capacity in balancing the resistance, construction of a bridge with Curtis resistances free from inductance and capacity, construction of the cell, use of especially good temp. baths, of weight methods in making the solns, and the use of a tuned telephone, are all said to be worked out in the paper. No results are given in the present report, but it was stated that the criterion of work was 0.01% accuracy. E. B. MILLARD.

Conduction of electricity through metals. J. J. THOMSON. *Proc. Phys. Soc. London* 27, 527–39(1915); see *C. A.* 9, 2482. PAUL D. FOOTE.

The Hall effect in the alloys of tellurium and bismuth. G. C. TRABACCHI. Univ. Rome. *Atti accad. Lincei* 24, I, 809–12(1915); see *C. A.* 9, 2183. E. J. W.

Experiments of J. J. Thomson on the dissociation of iodine vapor on the passage of electric sparks through it. W. KROPP. *Z. Elektrochem.* 21, 356–9(1915); cf. Thomson, *Proc. Roy. Soc. London* 42, 343(1887).—T. stated that when elec. sparks were passed through I vapor, a considerable increase in pressure took place, and that this high pressure persisted for 24 hours. This could only mean a dissociation into I^+ and I^-, corresponding to a degree of dissociation of 47%. Schmidt (*Ann. Physik* 68, 872(1905)) has shown that in air, N, H and O there is no measurable cond. (and therefore no dissociation) a fraction of a second after a discharge. A quartz app. and a Ladenburg and Lehmann spiral manometer were used to investigate the case with I, and it was shown that the phenomenon of T. did not exist. No dissociation which persisted was discovered. E. B. MILLARD.

Relation between electrolytic and chemical processes. IV. D. REICHINSTEIN. Zürich. *Z. Elektrochem.* 21, 359–72(1915); cf. *C. A.* 8, 18, 1559, 2103, 3760.—Further expts. have been made on the speed of soln. of Ni in 0.04 N H_2SO_4 in the presence of H_2O_2 and CrO_3 at various concns. The speed of soln. in H_2O_2 depends on surface phenomena and on the passivation of the Ni. A Ni foil which has been made passive in 3% H_2O_2 becomes active in 3% H_2O_2 + 0.04 N H_2SO_4; after reaching a high speed of soln. it again becomes passive in spite of the const. concn. of the surrounding soln. There are 2 passive states of Ni, in one of which a relatively large concn. of O_2 and a small concn. of O are dissolved in the electrode, and another in which the proportions of O and O_2 are reversed. In CrO_3 the Ni becomes passive more rapidly, and with smaller concns. of the passifying agent than with H_2O_2, which indicates a much more rapid

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formation of atomic O in the former case. In CrO_3 a condition of stationary soln. velocity was easily reached, as was shown by approaching the equil. from the active and passive states. The fact that activation of the Ni plate after reaching the stationary velocity leads to a higher velocity value is a confirmation of the ballast theory. In the light of this theory the slow passivation of Ni in CrO_3 is explained by the slow ballast formation in the electrode surface volume (O_2). The equations for the process were precisely formulated. The reaction proceeds in 4 stages: (1) adsorption of a part of the liquid phase (H^+ and oxidizing agent) by the Ni, (2) $H_2O_2 = H_2O + O$, or $2CrO_4^{--} + 10H^+ = 2Cr^{+++} + 5H_2O + 3O$, (3) association of a part of the atomic O in the electrode surface vol., (4) the soln. process $Ni + O + 2H^+ = Ni^{++} + H_2O$. The theoretical cases considered are: (1) reaction 2 is indefinitely rapid, *i. e.*, the solubility of O_2 in the electrode surface is negligibly small; (2) the concn. of O_2 in the electrode surface is zero; (3) it is const.; (4) several cases in which reaction 3 is slow. Neglecting higher powers, the main equation was $V = kC + k'C^2$, where V is the stationary soln. velocity, C is the concn. of the oxidizing substance, and k and k' are consts.

E. B. Millard.

Relation between photoelectric retardation and gas pressure for metal particles of ultramicroscopic size. Edgar Meyer and Walther Gerlach. *Ann. Physik* 47, 227–44(1915).—A method was worked out by which it was possible to pump the gas out of a Millikan condenser while a particle of ultramicroscopic size was held in suspension; by its application it was possible to observe the photoelectric effect on the same particle at different pressures. This effect, with air in the condenser and a Pt particle, was found to decrease with the gas pressure. The number of electrons emitted by a single illumination was independent of the pressure. At atm. and lower pressures the retardation increases with the charge of the particle and is a function of the pressure.

E. B. Millard.

The scattering and regular reflection of light by gas molecules. I. C. V. Burton. Oxford. *Phil. Mag.* 29, 625–36(1915).—Mathematical theory. G. L. Wendt.

Polarized fluorescence of ammonium uranyl chloride. E. L. Nichols and H. L. Howes. *Proc. Nat. Acad. Sci.* 1, 444–50(1915).—The spectrum of $UO_2Cl_2.2NH_4Cl.2H_2O$ consists of several equidistant groups, each contg. 5 nearly equidistant bands, with the spacing repeating itself with such precision in successive groups that the homologous bands form a series having a common and const. frequency interval. Observations at the temp. of liquid air show that these bands are really doublets, unresolved at 20° but sepd. at lower temps.; a dim companion of the band as observed at 20° increasing greatly in brightness as the temp. falls, while the dominant member becomes relatively feeble or disappears entirely. At low temps. all the bands are very narrow, so that overlapping components which are entirely indistinguishable at the temp. of the room appear as separate bands at —180°. The relative brightness and the temp. effect vary greatly with different bands. $UO_2Cl_2.2NH_4Cl.2H_2O$ crystallizes in triclinic plates which show a marked pleochroism. When the fluorescence and absorption bands are observed through a Nicol prism, marked changes are observed as the prism is turned with its plane of polarization parallel successively to the green and white planes of the crystal. Complete sepn. of the 2 polarized components occurs only when the crystal is perfect. Comparison of the fluorescence bands shows that in the various groups each band consists of 2 components polarized at right angles to each other. The stronger fluorescence is polarized in the green direction, corresponding with the greater adsorption. The location and roughly approx. relative intensity of the fluorescence of each group is shown in a diagram. Similar work on the corresponding K, Rb and Cs compds. has also been done, details of which will soon appear.

E. B. Millard.

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Connection of the Sommerfeld action principle with Planck's quantum theory. M. WOLFKE. *Physik. Z.* 16, 207–9(1915).—Theoretical. E. B. MILLARD.

Energy changes in gases. KOLOMAN SZELL. *Verh. deut. physik. Ges.* 17, 122–30 (1915).—Theoretical. The changes have been calcd. from the Boltzmann principle and from the kinetic theory of gases. E. B. MILLARD.

Circular polarization. M. BEREK. Diez. *Fortschr. Min. Krist. Petr.* 4, 73–114 (1914).—The phenomena of circular polarization are described, and their mathematical relations are worked out. The bearing of the subject on theories of crystal structure is discussed, and the analogy between asymmetric chem. and crystal mols. pointed out. E. T. WHERRY.

The electron theory of the optical properties of metals. II. G. H. LIVENS. Sheffield. *Phil. Mag.* 30, 434–45(1915); cf. *C. A.* 9, 1871. G. L. WENDT.

Interference measurements of wave length in the iron spectrum. KEIVIN BURNS. Bur. of Standards, *Sci. Paper* 251, 179–97(1915).—A more detailed report of previous work (cf. *C. A.* 9, 1424). The spectroscope used was a 21 ft. grating, mounted in parallel light, and the etalon was 3.75 mm. thick. Using the method of Buisson and Fabry, 131 wave lengths have been measured, in conformity with the recommendations of the international wave-length committee, as part of the more elaborate scheme of measuring a line every 10 Å over the whole spectrum of Fe. In the range covered (2851–3701 Å) the mean differences from the I. Å standard were 1 part in 2 million; the systematic difference was half of that. Between 2851 and 3300, where there are no I. Å. standards, a comparison with the work of Buisson and Fabry (*J. physique* 9, 229(1910), cf. also *C. A.* 6, 2353) showed a systematic difference of 1 in a million, and allowing for this, a mean difference of 1 in 3 million. E. B. MILLARD.

Comparisons of lengths of light waves by interference methods, and some wave lengths in the spectrum of neon. W. F. MEGGERS. Bur. of Standards, *Sci. Paper* 251, 198–205(1915); cf. preceding abst.—A redetn. of the corrections due to change of phase at reflection from the nickeled quartz interferometer plates used by Buisson and Fabry has been made, using the identical plates (cf. *J. physique* 7, 169, 417(1908), *C. A.* 2, 364, 2336). Their method of obtaining the correction was again applied, using an iron arc in place of a Hg lamp. The results confirmed the linear nature of the phase change. This change was then found by another method, using a Ne-quartz vacuum tube lamp as a source of light. Using the Ne yellow line $\lambda = 5852.4862$ as a standard, 8 lines between $\lambda = 5852$ and 6304 measured by Priest (*C. A.* 7, 1323) were again compared with this standard, with satisfactory agreement. In addition, 7 longer wave lengths and 10 in the ultraviolet were measured. Details of a simple way of finding the order of interference in an etalon are given. E. B. MILLARD.

Quantitative light filter for the ultraviolet part of the spectrum. N. P. PESKOV. *J. Russ. Phys. Chem. Soc.* 47, 918–42(1915).—After repeated trials with several substances, it was found that the best filter for absorbing all rays except the ultraviolet is a mixt. of gaseous Cl and Br contained in a vessel with quartz windows. By adjusting the concn. of the gases it is possible to eliminate all light waves except those in the interval 250–40 μ. The coeffs. of absorption by Cl and Br for 43 lines of the spectrum were detd. by a slight modification of Henri's method (*C. A.* 7, 3071). A series of algebraic equations is given for calcg. the coeff. of absorption of a mixt. of several substances. Numerous tables and curves illustrate the article.
H. M. GORDIN.

The tube-arc spectrum of iron and a comparison with dissymmetries in spark spectra. ARTHUR S. KING. Mt. Wilson Solar Observatory. *Astrophys. J.* 41, 373–394(1915); 3 plates.—The previous work on the tube arc spectra (cf. *C. A.* 7,

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1838; 8, 3264; 9, 15, 1577) is here extended. The location of the tube arc is made definite by filing the tube thin at its middle point. The photographs are made with a 4 in. plane grating, 2nd order, and 30 ft. objective in the vertical spectrograph. Exact measurements of the lines are made with the Koch microphotometer (*C. A.* 8, 3643). The results of the tube arc and disruptive spark show an unsymmetrical structure of many of the stronger lines; the region of strongest excitation gives a displaced line, usually toward the red. The degree of dissymmetry has a distinct relation to the width of the line. An increase of vapor density increases the dissymmetry. The most symmetrical lines of the Fe tube arc are the "flame" lines. The H and K lines of Ca reverse with the violet side strongest. The nebulus lines of Fe are much intensified in the tube arc. The radiation from the core of the disruptive spark is displaced toward the red. The outer vapor gives a symmetrical line in the position of the arc line. A condition of strong electrical excitation, combined with high vapor density, produces a condition with reference to the displacing action which shows many resemblances to the pressure effects. F. A. HARVEY.

Comparison of the arc and spark spectra of nickel produced under pressure; the influence of temperature and density gradients upon the displacement of spectrum lines. W. G. DUFFIELD. Reading. *Phil. Mag.* 30, 385–94(1915).—Measurements of 50 lines of the Ni spark and their displacement under 10 atms. compared with similar data of Bilham for the Ni arc (*C. A.* 9, 882), show differences only in the case of reversed lines. These are attributed to differences in the positions of absorption lines on bright lines which are equally displaced in the two cases. The position and width of the absorption lines depends on the density and temp. gradients about the luminous source. G. L. WENDT.

Dispersion of air and oxygen in the infra-red. G. STĂTESCU. *Bull. acad. sci. Roumanie* 3, 211–6(1915); *J. Chem. Soc.* 108, II, 298(1915).—The value of n has been detd. for dry air (atm.), and O for wave lengths between 5894.6 (Na) and 40000 Å. The method of Paschen was used in the measurements, a full account of which will be published shortly (*Phil. Mag.*). The measurements were made with a gas pressure of about 1430 mm. Hg. It was shown that there is no anomalous dispersion observable in the case of air up to wave lengths of 4.7μ, but that at this value the presence of CO_2 becomes noticeable. The dispersion was also normal for O. Tables of comparative values for both air and O up to $\lambda = 86784$ Å are given, taken mainly from the work of Koch (*J. Chem. Soc.* 88, II, 661(1905)). E. B. MILLARD.

An investigation of the accuracy of the lens and drop method of measuring refractive index. H. R. NETTLETON. Birkbeck Coll. *Proc. Phys. Soc. London* 27, 511–26(1915).—If a few drops of liquid are introduced between a plane mirror and a thin convex lens the result is in effect a combination of the glass convex lens and a plano-concave lens formed by the liquid. From the curvature of the lower face of the convex lens, its focal length, and that of the combination, the refractive index of the liquid can be calcd. This simple method will give 4 significant figures if certain precautions are followed in the choice of the lens. PAUL D. FOOTE.

Laws of photochemical reactions for discontinuous illumination. P. LAZAREV. *J. Russ. Phys. Chem. Soc.* 47, 958–64(1915).—According to Talbot's law, equal chem. effects cause nerve irritations of equal intensity. Hence equal amts. of light energy, acting during the same period of change in brightness, produce the same effects on the eye, no matter whether the light is continuous or discontinuous. By a rather complex mathematical analysis L. proves that this law holds good not only for visual impressions but for all photochem. reactions, whether they are or are not reversible when the light is shut off. The correctness of the law is corroborated by several examples from phys. and biological literature. H. M. GORDIN.

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The unit of candle-power in white light. CLIFFORD C. PATERSON AND B. P. DUDDING. Nat. Phys. Lab. *Proc. Phys. Soc. London* 27, 263–90(1915); cf. *C. A.* 9, 1720. PAUL D. FOOTE.

Photochemical temperature coefficient of chlorine. A. V. NAZAROV. *J. Russ. Phys. Chem. Soc.* 47, 943–55(1915).—Since photochem. reactions are supposed to be due to a photoelec. effect, and since the latter is independent of temp., the temp. coeff. of such reactions, at least during the initial period of their progress, ought to be 1. This was corroborated by expts. upon the addition of Cl to cinnamic acid in the dark and in the light. From the difference the mean value of the coeff. for the light reaction was found to be 1.402. In accord with Luther and Goldberg (*Z. physik. Chem.* 56, 43), the reaction had a period of induction on account of a small admixt. of O. For this reason all the expts. were made with a Cl containing the same amt. of the latter. H. M. GORDIN.

Photochemical reactions and photoelectric effect. G. S. LANDSBERG. *J. Russ. Phys. Chem. Soc.* 47, 908–18(1915).—The view is expressed that all photochem. reactions are caused by a photoelec. effect consisting in ionizing the reacting substances. This is shown by the fact that such reactions may be produced by any agent capable of causing ionization. It is further assumed that substances usually contain 3 kinds of electrons: (1) constitutional, or intraatomic, whose existence conditions the very life of the atoms; (2) interatomic, or intramol., or valence electrons, on whose existence depends the life of the mol. but not of the atom; and (3) intermol. or free electrons, which are the cause of elec. cond. in metals. It is the electrons of the 2nd groups that are liberated by the photoelec. effect. This follows from the consideration that the liberation of the interatomic electrons would require much greater energy than is at the disposal of the photoelec. effect, and that, on the other hand, the latter affects even gases which can hardly be supposed to contain electrons of the 3rd kind. The fact that the photoelec. effect is almost independent of temp., while phenomena depending upon the free electrons, *e. g.*, elec. cond., are strongly influenced by temp. changes, also indicates that these electrons are not concerned in photochem. reactions. Numerous other considerations supporting these views are cited from the literature.
H. M. GORDIN.

The electric spark. W. O. SAWTELLE. Haverford College. *Astrophys. J.* 42, 163–71(1915); 2 plates.—A preliminary paper which describes in detail the mechanism of the control of the spark discharge in an oscillating circuit, and briefly the spectrum of the light from an oscillating spark. F. A. HARVEY.

Application of the theory of allotropy to electromotive equilibria. III. A. SMITS AND A. H. W. ATEN. Univ. Amsterdam. *Verslag Akad. Wetenschappen* 23, 667–82 (1914).—According to the theory of allotropy, each metal which shows the phenomenon of "phase-allotropy" must contain various kinds of ions. Starting with this fact S. and A. show how the theory of allotropy may be applied to the study of the passivity of metals. A brief discussion is given of the various theories of passivity of metals. Expts. are then described, the object of which was to show whether the boundary surface between metal and electrolyte or the metal surface itself is the seat of the polarization and passivity. A suitable piece of the metal to be investigated was suspended by a fine Pt wire, and etched in acid. After being rinsed in H_2O it was made to form a rotating anode in 0.1 *N* salt soln. and the potential against a 0.1 *N* HgCl electrode measured as quickly as possible. With Ag, Cu and Pb the potential is not changed by etching (in agreement with the fact that these metals quickly assume internal equil.) but with Ni, Co, Cr and Fe p. ds. as high as one volt were found, the exact p. d. depending on the metal and on the acid used for the etching. Electrodes of Fe in 0.1 *N* $FeSO_4$ soln. gave a p. d. which decreased rapidly at first, then remained const. and then

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fell rapidly again. Addition of Br-H_2O to the salt soln. surrounding the electrode caused for Ni and Cr a gradual increase of p. d. with increasing conc. of Br. The p. d. afterwards decreased to a const. value. These results are explained on the basis of the effect of Br on the internal equil. in the metal. With Fe in 0.1 *N* $FeCl_3$ soln. the p. d. is not affected by the addition of Br or of KBr soln. but Cl caused a considerable rise in p. d. Cf. *C. A.* **8**, 2514. L. H. ADAMS.

Unmixing in a binary system in which the three-phase pressure is greater than the sum of the vapor pressure of the components. F. E. C. SCHEFFER. Amsterdam. *Verslag K. Akad. Wetenschappen* **23**, 682–8(1914).—S. previously found (*C. A.* **8**, 2095) that for mixts. of hexane and H_2O the 3-phase pressure was higher than the sum of the vapor pressures of the components; further expts. show that the same is true for pentane–H_2O (a mixt. of normal and isopentane was used) and C_6H_6–H_2O mixts., and in both cases the difference increased with increasing temps. It is pointed out that in each of the 3 cases studied the critical end point lies at a lower temp. than the critical temp. of both components; in the $T - X$ projection the plait-point curve has a point of minimum temp. G. W. MORRY.

The electromotive force of magnesium amalgams. LIVIO CAMBI. R. ist. tecn. sup., Milan. *Atti accad. Lincei* **24**, I, 932–6(1915).—Expts. were made with Mg-amalgams similar to those previously described for Ca-Hg. The solvents used were the same. The anhydrous $MgCl_2$ used was prepd. according to Hempel (*Ber.* **21**, 260(1888)) and the anhydrous MgI_2 according to Menschutkin (*Z. anorg. Chem.* **49**, 207(1906)). The methods and app. were the same as those used with the Ca amalgams and the Mg-amalgams were prepd. and treated as in the thermal expts. (*C. A.* **9**, 2847). The e. m. f. was measured in MeOH in 17 expts. ranging from 1 to 45 atomic % Mg in the cell, Mg_nHg_{100-n} | $MgCl_2$ 0.35 *M* | $MgCl_2$ 0.35 *M*, Hg_2Cl_2 | Hg at —80° and varied from —1.224 to —1.950 v.; E_H varied from —1.007 to —1.733. The e. m. f. of Mg is —1.702 v. and amalgams showed —2.048, —2.023 and —2.056 v. in the cell Mg | $MgCl_2$ 0.35 *M* | $MgCl_2$ 0.35 *M*, Hg_2Cl_2 | Hg. The Mg amalgams showed a slight tendency to passivity. In 12 e. m. f. detns. in C_5H_5N soln. at 5 to 38 atomic % Hg the cell Mg_nHg_{100-n} | MgI_2 0.038 *M* | $AgNO_3$ 0.1 *M* | Ag at 25° showed e. m. fs. ranging from —1.684 up to —1.858 and then down to —1.584 v. In this solvent the Mg shows a much more marked passivity. The curve shows the break corresponding to $MgHg_3$. A comparison of the e. m. fs. of Ca and Mg amalgams and of Ca and Mg shows that (1) Mg —1.82 v.; Ca —1.98 v. (E_H at —80° in MeOH: $MgCl_2$ 0.35 *M*; $CaCl_2$ 0.25 *M*); (2) $MgHg_2$ —1.63 v.; $CaHg_4$ —1.60 v.; (3) $MgHg_3$ —1.84 v.; $CaHg_4$ —1.82 v. (E at 25° in C_5H_5N: MgI_2 0.038 *M*; CaI_2 0.0093 *M*, with respect to the electrode Ag | $AgNO_3$ 0.1 *M* in C_5H_5N.) E. J. WITZEMANN.

Thermal analysis of the system dimethylpyrone–trichloroacetic acid (PLOTNIKOV) **10.**

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3. RADIOACTIVITY.

WILLIAM H. ROSS.

Research at the Vienna Radium Institute. F. PANETH. *Naturwissenschaften* **3**, 437–43(1915).—P. describes the laboratories and discusses the many investigations carried out at the institute. C. G. F.

Radioactivity of Roumanian mineral waters. EMIL GIURGEA. *Bull. sci. acad. Roumanie* **3**, 54–61(1915); *Chem. Zentr.* **1915**, II, 47.—Expts. with the Schmidt app. showed that the waters are only weakly radioactive. Only in water from Borca

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was a radioactivity of over 3 Mache units obtained. All of the samples had been allowed to stand before the measurements were made. E. B. MILLARD.

Treatment of bismuth with cathode rays. W. P. JORISSEN AND J. A. VOLLGRAFF. *Chem. Weekblad* **12**, 741–4(1915).—Pure powdered Bi was subjected to the action of cathode rays, using the same method and app. as in the expts. with U_3O_8 (*C. A.* **8**, 3755). On the Al anode was a small holder of Jena glass, filled with Bi powder. After heating, a microchem. analysis of the Bi showed no Tl. The treated Bi did not affect the electroscope. Treated and untreated Bi placed on a photographic plate, wrapped in black paper, produced no action in a week. A spectroscopic analysis of treated and untreated Bi showed the Tl line in both samples; the quantity of Tl amounted to less than 0.001 mg. in 0.607 g. of Bi. The transmutation of Bi to Tl, if any, must have been less than 1 atom in 650,000. J. T. FLOHIL.

The mobility of negative ions at low pressures. J. J. THOMSON. *Phil. Mag.* **30**, 321–8(1915).—A calculation indicating that the mobility of a negative particle, as measured by its av. velocity over a given distance under a unit elec. force, is not a definite quantity, but may lie anywhere between that of an ion and that of an electron. Only at pressures so low that the mean free path is comparable to the distance measured is the mobility substantially definite, and no greater than that of an ion.

G. L. WENDT.

Maximum frequency of the X-rays from a Coolidge tube for different voltages. E. RUTHERFORD, J. BARNES AND H. RICHARDSON. Manchester. *Phil. Mag.* **30**, 339–60(1915).—The absorption curves in Al of the X-radiation from a Coolidge tube under const. voltages from a Wimshurst machine show that absorption is not exponential excepting after only 1/500 of the radiation remains unabsorbed, but for this "end" radiation it is exponential over a wide range of intensity. The same is true for the rays obtained under high voltages from an induction coil. The frequencies were calcd. by assuming an extension to high frequencies of Bragg's formula, $\mu = k\lambda^{6/5}$. Frequency and penetration rize between 13,000 v. and 145,000 v., but there is no further increase up to 175,000 v. The shortest wave-length found was 1.71×10^{-9} cm., for which $\mu_{Al} = 0.39$ cm.$^{-1}$, and $\mu_{Pb} = 23$ cm.$^{-1}$, which is 0.3 of the penetration of the γ-rays from Ra C. If the at. number of W is 74 and that of Ra B is 82, Moseley's relation, $\nu = k(N-1)^2$, demands a characteristic "K" series line for W at $\lambda = 1.69 \times 10^{-9}$ cm. to correspond with the Ra B γ-ray line at $\lambda = 1.37 \times 10^{-9}$ cm. The close agreement with the measured line proves the correspondence. The β-rays from Ra B have a velocity corresponding to a potential fall of 400,000 v. and those from Ra C of 2,000,000 v. Their shortest γ-ray wave-lengths are not less than 0.6 of that here measured, so that no further increase in X-ray frequencies is looked for with attainable potentials. The max. frequency attainable by electron bombardment depends on the characteristic radiation of the atom bombarded, and the highest possible would be that from U, which is calcd. at $\lambda = 1.40 \times 10^{-9}$ cm. The observed relation $h\nu = E - cE^2$, where E is the energy of the electron, c a const., and h Planck's const., holds up to the max. at 145,000 v. It differs from Planck's relation, $h\nu = E$, because not all the energy of the incident electron is expended in ejecting an electron from one ring of an at. structure into the next, as on Bohr's theory for low frequencies. In order to excite the higher frequencies the incident electron must penetrate deep into the atom, where electrons are closely packed, and part of the energy is used in setting neighboring electrons in motion. This correction increases rapidly with the frequency, and at the max. twice as much voltage is needed as is allowed by Planck's equation.

G. L. WENDT.

Efficiency of production of X-rays from a Coolidge tube. E. RUTHERFORD AND J. BARNES. Manchester. *Phil. Mag.* **30**, 361–7(1915).—The ratios of X-ray energy

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to cathode-ray energy at 48,000, 64,000 and 96,000 v. are, resp., 0.59 × 10^{-3}, 0.74 × 10^{-3}, and 1.04 × 10^{-3}. They are proportional to the square of the velocity of the cathode particles. "Characteristic" radiation would be more efficient, and the low values thus indicate that the Coolidge radiation is mainly of the "independent" type and that the "K" characteristic radiation is not so strongly excited as with metals of lower at. wt. Not more than 1 electron in 200 is efficient in producing radiation. G. L. W.

The high-frequency spectrum of tungsten. JAMES BARNES. *Phil. Mag.* 30, 368–70(1915).—Reflection of X-rays from a Coolidge tube with W anticathode by a rock-salt crystal showed the following wave-lengths in 10^{-8} cm.: 1.477, which is Moseley's α-line of the L series; 1.296 and 1.258, which are the missing β- and γ-lines of this series; 1.277, which is ϕ radiation; and the new lines, 1.312, 1.113 and 1.082, which have no analogs. No lines of the K series were found even with 100,000 v., but in their place a broad continuous spectrum. G. L. WENDT.

Residual ionization in gases. J. C. MCLENNAN AND C. L. TRELEAVEN. Univ. Toronto. *Phil. Mag.* 30, 415–27(1915).—All possible causes for the residual ionization of 4 ions per cc. per sec. over a water surface have now been excluded (*C. A.* 8, 17), excepting spontaneous explosion of the gas mols. and some feeble radiation from the Zn walls of the Wolff electrometer. By comparing the residual ionization in air, CO_2, H, C_2H_4 and N_2O with the ionization from feeble sources of α-, β- and γ-rays, a radioactivity of the Zn seems probable, of which some 37% is α-radiation. There is no evidence for true spontaneous ionization excepting in C_2H_2, in which there are 27 residual ions per cc. per sec. Here mol. collisions or spontaneous at. or mol. disruptions probably act. G. L. WENDT.

The residual ionization of air inclosed in a vessel of ice. J. C. MCLENNAN AND H. G. MURRAY. Univ. Toronto. *Phil. Mag.* 30, 428–34(1915); cf. preceding abstr. —When an ice cylinder of 30 l. capacity was substituted for the pure Zn chamber connected with a Wilson electroscope, the residual ionization on land at Toronto dropped from 7.62 to 4.37 ions per cc. per sec. Measured on the ice of Toronto Bay, the value dropped from 4.65 to 2.60, the latter being the lowest ever recorded. This is taken to show that the former residual ionization was due to radiations from the Zn walls, and the residue of 2.6 is due to the radioactivity of the ice, which was made from Lake Ontario water. A cylinder of distilled water ice, measured over the bay, raised the value to 5.5, and radioactive impurities collected in the still are suspected. G. L. WENDT.

The atomic weight of uranium lead. O. HÖNIGSCHMID AND S. HOROVITZ. Radium Inst., Vienna. *Monatsh.* 36, 355–80(1915).—Samples of St. Joachimsthal pitchblende, carefully selected for freedom from "ordinary" Pb, gave a value of 206.40 for the at. wt. of Pb (cf. *C. A.* 8, 3752, and 9, 1148). A very ancient crystallized uraninite from Morogoro, German East Africa, containing 88% U_3O_8 and 7.5% PbO gave 206.04 and a crystallized bröggerite from Moos, Norway, gave 206.06. A control analysis of ordinary Pb gave 207.18. Analyses were made by the Harvard chloride method. Complete analytical details and a theoretical discussion are given. Both arc and spark spectra of the Morogoro U Pb coincide precisely with the ordinary Pb spectrum, and the spectrographs are reproduced. The value 206.0 is that predicted by the Fajans-Soddy relation for Ra G (cf. *C. A.* 7, 1442, 1669). The bröggerite contained 4.5% ThO_2, and should have contained enough Th E to raise the at. wt. of the Pb by 0.03 to 0.05 unit. The absence of this effect may indicate that Th E, with a theoretical at. wt. of 208, is unstable and not the end-product of the Th series. Cf. *C. A.* 9, 1147. G. L. WENDT.

Determination of the radium content of weakly radioactive substances by gamma-ray measurements. W. BOTHE. Charlottenburg. *Physik. Z.* 16, 33–6(1915).—

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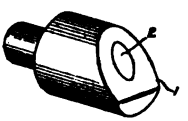
Solid substances having a Ra content as low as 4×10^{-8} mg. of Ra per cu. cm. may be measured by the γ-ray method more conveniently than by the usual Em method by using a special form of electroscope. B. describes a cylindrical form of electroscope 32 cm. high, 20 cm. in diam., and lined internally with Pb 0.5 mm. thick. The central electrode, which stands vertically from the bottom where it is insulated by a ball of S, consists of a hollow cylinder of brass 16 cm. high and 2.8 cm. internal diam. lined on the outside with Pb. The cylindrical electrode is round at both ends and is provided above with a removable cap through which the solid material to be examined is introduced after being sealed in a glass test-tube which just fits inside the cylinder. The distance between the bottom of the electrode and the insulation is 11 cm., which permits the Au leaf to be attached just below the bottom of the cylinder. The leaf is observed in the usual way by means of mica windows in the wall of the outer cylinder. The central electrode carrying the leaf system is charged from above. Several advantages are attained by placing the active material inside the inner electrode. The radiation is effective in all directions, and the effective vol. is const. and definite. Two kinds of corrections must be taken into account, the absorption of the radioactive material itself, and its spacial distribution inside the electrode with respect to its radiation. The latter was examined by placing a point source of radiation at various points inside the cylinder, with the result that the mean was found to be represented by the center of the cylinder. The absorption correction was examined by using a point source buried at various locations in the cylinder filled with silica as absorbent. Again the conclusion was reached that the av. of the entire vol. is represented by the center, and therefore it is only necessary with different absorbent materials to make one measurement with a point source at the center. This correction for SiO_2 was 7.5%; for $PbCrO_4$, 26.3; for a mixt. of SiO_2 and $PbCrO_4$, 17.2; for CaO, 3.7; and for a pptd. weakly active $Ba(Ra)SO_4$ (sp. gr. 0.53), 4.9. For substances of d. < 1 the percentage is given by multiplying the d. by 7. The result for SiO_2 by the point method was verified by taking 2 equal quantities of Ra salt, one of which was used to impregnate the SiO_2, and the other was sealed as a point source. The correction in this case was found to be 8.2%. The percentage accuracy of the measurements decreases with the Ra content until the error reaches 7% for material containing about 4.2×10^{-8} mg. of Ra per cu. cm. This would easily include high grade pitchblende and most crude sulfates but not the usual grades of carnotite nor any of the other low grade minerals nor radioactive rocks for which the Em method must be used. S. C. LIND.

The applicability of selenium to the measurement of the energy of Röntgen rays. F. VOLTZ. *Physik. Z.* 16, 209–12(1915).—Attempts have frequently been made to utilize the change of conductivity of Se when exposed to light for energy measurements of the latter. But neither in the region of visible nor of ultraviolet light could useful results be obtained on account of the variability of the phenomenon. V. finds that the same is true in the very short wave-lengths of Röntgen rays. The values obtained by measurement of the current are subject to the influence of several variable factors, such as time, frequency of interruption, and the selective absorption of Se itself, rendering them useless. S. C. LIND.

Emission of corpuscles in chemical reactions (TANATAR) **2. Formation of colloids of metals exposed to light, Röntgen and radium rays** (NORDENSON) **2.**



U. S., 1,153,290, Sept. 14. W. D. COOLIDGE. **X-Ray targets** are formed of Mo 1, with a body of W 2, mechanically embedded in the working face exposed to cathode rays. The body of Mo serves to make a lighter target of greater thermal capacity than one consisting entirely of W.

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U. S., 1,154,230, Sept. 21. O. P. C. BREDT. **Concentrating the radium contents of radium barium sulfate residues.** The residues are fused with sufficient alkali, *e. g.*, Na_2CO_3, to convert about 95% of the sulfates into acid-sol. form and the residues are then treated with H_2O and HCl to remove the acid-sol. Ba compds. from the $RaSO_4$ which remains as an insol. residue. The process is repeated until the desired degree of concn. is effected.

U. S., 1,154,231, Sept. 21. O. P. C. BREDT. **Concentrating ores and residues containing radium sulfate.** The material is treated with boiling H_2SO_4 in small amt. to dissolve the Ba as bisulfate without dissolving the $RaSO_4$, the soln. is sepd. and treated with H_2O to ppt. mixed sulfates and the residue is repeatedly treated with small amts. of boiling H_2SO_4 to effect fractional sepn. of the Ba and Ra compds. The latter are dissolved in the last stage of the process and are pptd. by adding H_2O.

4. ELECTROCHEMISTRY.

COLIN G. FINK.

The American Electrochemical Society in its external relations. F. A. LIDBURY. *Trans. Am. Electrochem. Soc.* 27, 15–22(1915).—Presidential address. C. G. F.

An electric vacuum furnace of universal applicability. G. OSSTERHELD. Basel. *Z. Elektrochem.* 21, 54–60(1915).—The furnace comprizes a horizontal tubular heating element supported by heavy water-cooled copper uprights which project downward from the removable cover of the cylindrical copper vessel serving as the evacuated container of the furnace. The uprights serve as current leads. One of them is fastened directly to the cover; the other passes out through a gas-tight insulating packing. The heating tube may be of sintered W or of C, and is normally 16 mm. in internal diam., 20 mm. external diam., and 80–100 mm. long. The tube wall is turned a little thinner for about 60 mm. near the center. The material to be heated is placed within the tube, which is held in place by heavy copper spring-bushings projecting from the upright supports, and is surrounded by a concentric MgO or C jacket to cut down radiation losses. The furnace can be used as an arc furnace by replacing the heating tube by 2 carbons, one of which is adjustable by means of a rack and pinion actuated from without by a rod passing through an air-tight packing. The cover of the furnace is bolted in place, a rubber packing ring making a gas-tight joint. The valve through which the vessel is exhausted is placed in the furnace cover. The temp. of the heating element can be observed through a heavy glass window in the side of the furnace. The whole furnace is surrounded by an open copper vessel through which water circulates. An adjustable step-down transformer is used to supply the necessary current. The secondary has a range of from 2 to 24 v. and can carry 2500 amps. continuously and 3000 amps. for a brief period with safety. The W-heating element can be brought from room temp. up to 2000° in 1 min., and with the C tube W can be melted in 3 min. With the W tube, a temp. of 2200° can be obtained with an energy consumption of 10.3 kw., and with the C tube, 2500° can be reached with 10.7 kw. energy consumption. F. A. STRAUSS.

Progress in the iron and steel industry and the electric furnace. K. G. FRANK. *Proc. Am. Inst. Elec. Eng.* 34, 2547–54(1915).—F. traces the history and development of the elec. furnace and emphasizes the fact that the elec. furnace can produce steel of quality superior to that produced by the older methods. The points of superiority are: (1) the elec. furnace produces a temp. higher than any other furnace and produces such higher temp. economically. (2) It produces these higher temps. without contamination of the charge through gases and other impurities and, in case of the induction fur-

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nace, without contamination through carbon. (3) It offers the possibility of controlling the temp. within limits which are entirely beyond the reach of the older furnaces.
C. G. F.

Electric iron-ore smelting in Sweden. J. A. LEFFLER. *Engineering* 100, 131–3 (1915).—L. traces the development of elec. Fe-ore smelting from the small exptl. furnace at Domnarfvet (1909), through the larger, but still exptl. furnace at Trollhätten, to the furnace now being constructed at the Söderfors Works. The first utilizes about 500 kw., the 2nd 1900 kw., and the last, depending on the amt. of energy for which the shaft will be dimensioned, will absorb from 4500 to 6000 kw. The smelting chamber in this latest type will have at the bottom and up part of the sides a layer of closely packed crushed coke or electrode fragments, between the arch and the neck a H_2O cooled ring, serving as the terminus of the arch and on top of the arch, as a protection against pressure from within, there will be used a covering of steel plate, connected with the plating of the bosh and smelting chamber. Another important feature for the working and economy of the furnaces is the circulation of the gas by Jaegar fans; by these the amt. of gas per unit of time can be kept constant. The newest furnace is also surrounded by a house of reinforced concrete around the lower portions. L. then describes in great detail the furnaces ("Elektrometalltype") at Domnarfvet, those at Hagsfors, and the large new one at Söderfors, touching on prepn. of the ore before smelting, source of elec. energy and app. for same, charging of ore and charcoal, gas circulation, costs, and outputs. Several diagrams showing the various types are given.
I. C. MATTHEWS.

Heat losses from an electric steel furnace. W. H. WILLS AND A. H. SCHUYLER. Lehigh. *Trans. Am. Electrochem. Soc.* 28(1915) (advance copy); *Chem. Eng.* 22, 107–10.—The furnace was of 2-ton capacity, with 3 graphite water-cooled electrodes, 8 in. in diam., passing through the roof. The front had a pouring spout, and each side a charging door. The power supply was 40 kw., 3-phase 60-cycle, a. c. at 80 v., and normal current per phase 2500 to 3000 amps. The av. power input during a run of $4^1/_2$ hrs. was 350 kw. By measuring the temp. and velocity and detg. the composition of gases escaping through the charging doors and tap hole, the heat loss was calcd. to be 12.5% of the power input. The heat lost in the electrode cooling water, plus the heat conducted away by the electrodes, amounted to 7.3% of the power input. The charging doors and tap hole should be as tightly closed as possible.
SHERMAN EASTMAN.

Electric steel costs. F. T. SNYDER. *Trans. Am. Electrochem. Soc.* 28(1915) (advance copy).—The operating costs of two sizes of elec. furnaces in common use are compared with those of fuel-fired furnaces. Costs given do not include supervision or overhead costs and the figures represent the average of regular com. operation during long-continued service. Itemized data show total cost of operation of a 10-ton furnace per day to be $190.60, and per ton of molten metal $19.06. For the 6-ton size, these values are $128.14 and $21.36, resp. These various items are analyzed and it is shown that these furnaces show a thermal efficiency not far from double those of earlier design. The plea for existence of the elec. furnace does not now rest alone with improved quality of product but upon cost as well.
W. E. RUDER.

The oxidation of nitrogen by electric discharge in the presence of ozone. II. V. EHRLICH AND F. RUSS. *Monatsh.* 36, 317–54(1915).—A continuation of previous work (*C. A.* 6, 1571; 7, 3275). It was found that the arcing potential changed with the constantly changing chem. compn. of the gases. O_3 and N_2O_5, even in very small quantities, increase the arcing potential of N_2-O_2 mixts. This causes a substantial increase of all the elec. values in the gas tube.
W. E. RUDER.

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Electrolytic refined copper. A. C. CLARK. *Trans. Intern. Eng. Congress* 1915 (advance copy), 9 pp.—A history of the industry, whose annual output in the U. S. is 1,500,000,000 lbs. The multiple system as improved by Walker is being installed in the newer plants and a cathode Cu assaying 99.96% is obtained without difficulty. Anode and cathode furnaces have been increased in size to capacities of 500,000 lbs. per charge. H. L. OLIN.

Some problems in copper leaching. L. D. RICKETTS. New York. *Trans. Am. Electrochem. Soc.* 27, 35–46(1915).—This is a very comprehensive collection of papers containing a mass of valuable information. R. finds that dil. H_2SO_4 gives a very high extn. on the oxidized Ajo carbonate ore (see *C. A.* 9, 1451). An electrolytic method for the recovery of pure Cu from sulfate solns. is far preferable to others and will produce cheap Cu. In all cases a low c. d. will be required. Hard Pb anodes or composite anodes of hard Pb and coke of uniform thickness are preferable. An electrolytic method with control of the amt. of Fe and Al in the electrolyte, and without the use of SO_2 gas, has been found to be practicable. An acid loss of about 1.5 lbs. per lb. of Cu will be sustained. Chamber acid is required. The cheapest electrolytic method for the sulfate solns. is that without Fe control and the use of the requisite quantity of SO_2. Fe and Al in this soln. act as depolarizers and catalytes. This method gives a high yield of cathode Cu and sufficient H_2SO_4 to replace the waste. Sulfide ores or ores carrying large quantities of clay cannot be put through this process without special preliminary treatment. U. WEDGE. Ardmore. *Ibid* 46–51.—If the sulfide and mixed ores of Ajo are ground to 20- or 30-mesh and furnaced at slightly above red heat they can then be leached at once in H_2O with as good % recovery as have been secured in the case of the carbonate ore described by Ricketts above. The Cu solns. secured can be electrolyzed and sufficient H_2SO_4 can be produced from the electrolysis for use in leaching the carbonate ore. The Rio Tinto Co. leaches about 750,000 tons of Cu ore per annum. Their process is likewise essentially a sulfatizing roast. The leaching process with NaCl is carried out very extensively in Germany and England. E. A. CAPPELEN SMITH. *Ibid* 51–4(cf. *C. A.* 8, 2545).—The Chuquicamata ore is a chloride. This can be readily leached so that the tailing will contain only 0.015 to 0.03% sol. Cu. The Cl is eliminated by passing the soln. through cylinders 30 ft. long and 4 ft. in diam. half filled with shot Cu. The Cl is pptd. as Cu_2Cl_2 and is then briquetted with limestone and coke and reduced in a blast furnace, $CaCl_2$ being produced as slag. The ore contains no sol. impurities such as As or Sb. Sol. lime and Al and alkali salts are negligible. G. D. VAN ARSDALE. *Ibid* 54–6 (cf. U. S. Pat. No. 723,949).—Cu is pptd. from sulfate solns. by heating with SO_2 under pressure: $CuSO_4 + SO_2 = Cu + 2H_2SO_4$. This process is not yet on a large commercial scale. The process at Douglas is sulfatizing, roasting, leaching, electrolyzing the solns. and using depolarizers. For this ore are required a high concn. of $FeSO_4$ and $Al_2(SO_4)_3$ in the leaching soln.; c. d. = about 15 amp. per sq. in.; sufficient SO_2 to reduce the voltage and keep the Fe in the ferrous state. Yield is about 2 lb. Cu per kw.-hr. R. F. BACON. *Ibid* 56–9.—B. found it was cheaper to ppt. the Cu directly with SO_2 under pressure than to use the SO_2 as an anode depolarizer (Nevada ore). In the Weidlein process a very large % of H_2SO_4 is constantly regenerated. The 40-ton plant in Nevada uses SO_2 derived from dil. flue gases. F. J. POPE AND A. W. HAHN. *Ibid* 59–63.—In order to keep the Fe in the electrolyte (from Ajo carbonate ore) below the percentage deleterious to elec. efficiency, the Hoffman process of adding Cu oxide to the heated soln. (94°) and agitating with air was used and Fe pptd. The Cu oxide must be very finely divided (200-mesh). About 90% of the total Fe can thus be readily removed; at the same time, about 65–70% of the Al_2O_3, 50% of the Mn and all of the As, Sb and Bi are pptd. Only one-quarter of the total electrolyte is treated in this manner. J. P. CHANNING AND R. C.

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CANBY. *Ibid* 63–4.—The Miami and new Keystone ores are a mixed chalcocite and carbonate; a dead roast was found to be practicable preliminary to leaching. The electrolyte was caused to flow crosswise of the cell instead of lengthwise against the flat surfaces of the cathodes and anodes. Accordingly, a c. d. of 10 to 12 amp. per sq. ft. and a bath temp. of 18 to 20° gave good adherent deposits of Cu. R. LAMB. *Ibid* 65–8.—The High Hill (Va.) ore contains 89% SiO_2 but is ideal for leaching. The ore was ground to 10-mesh, roasted and leached in a 10° Bé. SO_2 soln. An output of 30.6 lbs. of pure electrolytic Cu per h. p. day (of 24 hrs.) was obtained. L. ADDICKS. *Ibid* 68–71.—For sulfide ores wet concn. including flotation, followed by the usual smelting method is more economical than to roast and leach. At the Douglas plant graphite anodes were found to be practicable. $FeSO_4$ was used in place of SO_2 to great advantage as a depolarizing agent. In order to secure thorough depolarization the soln. is violently agitated by means of compressed air. The c. d. is 13.5 amp. per sq. ft. at a bath temp. of 46°. J. V. N. DORR. *Ibid* 71–2.—The countercurrent washing system has proved so successful in cyaniding that its application to Cu leaching seems certain. C. G. F.

Electrodeposition of nickel. C. W. BENNETT, C. C. ROSE AND L. G. TINKLER. Cornell Univ. *J. Phys. Chem.* 19, 564–8(1915); cf. *C. A.* 8, 2310.—The effect of rotating the cathode upon the efficiency of deposition of Ni from a Ni-NH_4 sulfate soln. containing varying amts. of NH_4OH was studied. One, 5 and 10 cc. of 10% NH_4OH were added to 120 cc. of the electrolyte, which was the same as that used in the previous work (*l. c.*). C. d. 1.25–1.50 amp. per cm^2. Efficiency measurements were made at $^1/_2$-hr intervals. With 1 cc. of NH_4OH soln., the curve representing efficiency of deposition starts at about 81% and rizes gradually to nearly 100% at the end of 4.5 hrs. With a cathode rotating at 1000 r. p. m., the curve starts at 40% and rizes rapidly at first and then more slowly to a value slightly above that for the stationary cathode. With 5 and 10 cc. of NH_4OH, the curves with both rotating and stationary cathodes are nearly straight lines, the efficiency increasing very slightly with time. In all 4 cases the efficiency is about 80% or above, the stationary cathodes in each case being slightly more efficient. These expts. show that the efficiency of deposition is increased by decreasing the ionic H^+ concn., and that agitation has no practical effect upon the efficiency of deposition when the H^+ concn. is low. Expts. with a highly alk. soln. were next carried out, a soln. containing approx. 5% $Ni(CN)_2$ and 7% KCN being used. C. d., 5 amp. per cm^2.; time of run, 1 hr. The soln., which was red at the start, in the case of the stationary cathode turned a dark red with the pptn. of green $Ni(CN)_2$ or $Ni(OH)_2$ during the run. In the case of the rotating cathode, the soln. turned lemon-yellow, and less ppt. formed than with the stationary cathode. The efficiency of deposition from this soln. has been shown to be only about 0.05% because of the low concn. of Ni^{++} ions in the soln. Hence rotation should increase the efficiency by reducing impoverishment. This was found to be the case, the efficiency with rotating cathode (ranging from 0.13% at 500 r. p. m. to 1.65% at 2000 r. p. m.) being higher than that with stationary cathode. The efficiency was also found to increase with increasing speed of rotation, as might be expected. F. A. STRAUSS.

Electrolytic separation of zinc on the surface of solutions. A. A. TITOV AND S. M. LEVI. *J. Russ. Phys. Chem. Soc.* 46, 909–34(1914).—An examn. of the conditions under which the electrolytic sepn. of Zn takes place in the form of a film on the surface of the electrolyte (Mylius and Fromm, *Wied Ann.* 51, 593) gave the following results: In this form Zn may be deposited from solns. of either $ZnSO_4$, $ZnCl_2$ or $Zn(AcO)_2$, provided the solns. contain the proper concn. of H ions, the amt. of acid required for the formation of a good film differing with the strength of the current. The formation of spongy Zn is injurious to the growth of a dense film; every step taken to

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prevent the formation of the former facilitates the growth of the latter. The best films are produced when the Zn is deposited in very fine, pale crystals. Films are formed within a considerable range of c. d. and concn. of the soln.; the lower this concn. the smaller the c. d. required for the formation of films, but the latter are the thinner the lower the concn. and the greater the c. d. On the periphery of the films the c. d. during their growth remains const. if the current strength is kept const., but on the lower surface of the films the c. d. quickly drops. The film is located between the layers of oil and H_2O, and being well moistened by the former, remains suspended in its position. There is a great resemblance between the Zn films and the dendrites produced between layers of 2 different media. H. M. GORDIN.

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NaI	650° C. = 2.05 v.	1.48×10^{-4}
KI	650° C. = 2.2 v.	1.48×10^{-4}
Na_2SO_4	890° C. = 2.5 v.	2.00×10^{-4}
K_2SO_4	890° C. = 2.6 v.	2.00×10^{-4}
Na_2CO_3	= 1.3 v.	....
$CaCl_2$	= 2.85 v.	0.685×10^{-4}
[illegible]	3.0 v.	0.715×10^{-4}
[illegible]	3.05 v.	....

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Na_2CO_3	770° C. = 1.3 v.	....
$CaCl_2$	585° C. = 2.85 v.	
$SrCl_2$	615° C. = 3.0 v.	
$BaCl_2$	650° C. = 3.05 v.	

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W. F. FARAGHER.

Edison and the invention of the electric incandescent lamp. ANON. *Elec. Rev. West. Elec.* 67, 676–8(1915).—An historical review. C. G. F.

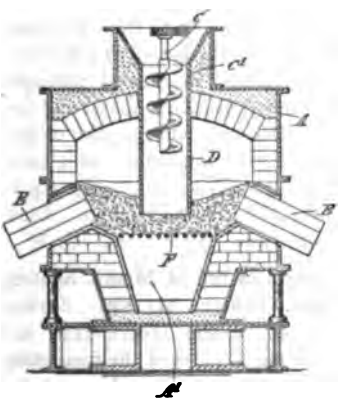
Measuring heat by small electromotive forces. F. G. COBURN. *Am. Machinist* 43, 671–4(1915).—Describes the potentiometer method, cold junction compensator, methods of checking pyrometers, rare metal and base metal thermocouples, and methods of taking, heating and cooling curves of irons and steels. C. G. F.

Experimental data concerning the safe operating temperature for mica armature coil insulation. F. D. NEWBURY. *Proc. Am. Inst. Elec. Eng.* 34, 2555–72(1915). —N. gives the results of 3 series of tests made on the first 3750 millivolt-amp. generator installed at Niagara Falls. When suitable mica insulation is used the effect of temp. on insulation becomes of little importance; the limit to temp. is detd. by other factors, such as the m. p. of the solder used or the linear expansion of the Cu conductors. The tests show that 150° F. (66° C.) is a conservative limit giving a liberal factor of safety. C. G. F.

Unit of candle-power in white light (PATERSON) 2. Relation between electrolytic and chemical processes (REICHINSTEIN) 2. Electrolytic bleach plants for paper mills (WHEELER) 23.

PEEK, F. W.: **Dielectric phenomena in high voltage engineering.** McGraw-Hill Co. New York. pp. xv + 265. $3.00.

U. S., 1,153,786, Sept. 14. F. W. HIGHFIELD. **Furnace for reducing zinc oxide.** ZnO is fed into the furnace through the tube *D* which is formed of fireclay to permit passage of CO through its walls. The lower end of the tube *D* is surrounded by a mass of porous C (supported on a grate, *F*) heated by electrodes *E*. An atm. of CO is maintained around the tube *D* and the reduced Zn collects in the chamber *A'* beneath the grate.



U. S., 1,154,009, Sept. 21. R. H. GODDARD. **Electrolytic apparatus for producing gases** (*e. g.*, H and O from acidulated H_2O).

U. S., 1,154,081, Sept. 21. E. WEINTRAUB. **Sodium magnesium borosilicate glass** is used for sealing W or Mo conductors in the walls of Hg vapor lamps, etc. It has approx. the same coeff. of expansion as the W or Mo.

U. S., 1,154,091–2, Sept. 21. J. B. BURDETT. **Electrolytic apparatus for producing oxygen and hydrogen from water** (structural features).

U. S., 1,154,393, Sept. 21. C. W. HILL. **Arc light electrodes** are formed with a core of substantially pure C of good conducting qualities with a surrounding thicker portion of flaming materials which are less resistant to the action of the arc so that in use the core projects at the end of the electrode.

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U. S., 1,154,514, Sept. 21. R. JACOBY. **Incandescent electric lamps with W** filaments are filled with argon mixed with 0.1–10% of N. The efficiency of the filament is greater than *in vacuo*.

Brit., 12,358, May 19, 1914. WESTINGHOUSE METALLFADEN GLUHLAMPEN-FABRIK GES. S, Se, or Te is used as a protective and lubricating coating in the **working of tungsten and other refractory metal wire** by hammering, rolling, or drawing. The deposit may be obtained in any manner, such as by placing the metal in an atm. of the vapors of the substances, thus simultaneously heating the metal, or by passing the wire through molten material.

Brit., 13,095, May 28, 1914. A. THOMAS and J. STOTT. **In galvanic batteries,** cells, connections, and cases are all made of metal coated with vitreous or porcelain enamel to protect them from acid. Boxes of Fe, steel, Al, etc., are pickled, washed, and dried, coated with enamel material, dried, and fired. Terminals, couplings, nuts, and bolts, and other external parts of batteries are enamelled similarly, to protect and insulate them. The enamel can be made from materials such as flint, ground glass, feldspar, cryolite, pearl-ash, Pb silicate, KNO_3, borax, and $NaNO_3$. The ingredients are melted, cast into slabs, broken up, remelted and cast, pulverized, and applied wet by dipping or brushing, or dry to surfaces previously gummed, etc.

Brit., 13,355, May 30, 1914. N. V. HYBINETTE. **Electrolyzing an acid nickel sulfate solution** with anodes containing Cu and Ni, and freeing the resulting soln. from Cu, for re-use, by cementation on slabs which consist mainly of Cu, Ni, and S, and have previously been employed, say, for 24 hrs., as anodes to bring their surfaces to the required condition. The slabs may be produced by smelting, in a blast furnace, an incompletely roasted mat, or, if more Cu is present, a mixt. of unroasted ore with ore which has been roasted and leached to remove Cu. The soln. obtained from roasted ore may be electrolyzed to deposit most of the Cu, and the residual, impure $NiSO_4$ crystd. and either smelted to form anodes or added to the electrolyte. In order to prevent diffusion of Cu through a porous partition to the cathode chamber, without employing a rapid countercurrent of electrolyte, the fresh soln. is introduced alternately at the bottom and top of the cathode compartment, which may be enclosed by filter cloth stretched on wooden frames.

5. PHOTOGRAPHY.

LOUIS DERR.

Reducing power of photographic developers as measured by their single potentials. F. C. FRARY AND A. H. NIETZ. *J. Am. Chem. Soc.* 37, 2246–63(1915).—The more or less rapid variations in potential measurements with photographic developers during the first period (sometimes for weeks) show nothing concerning the real potential of the developer, no matter what form the curve may take. The expts. of Mathews and Barmeier (*C. A.* 6, 3065), which covered a period of 6–20 hours, show nothing in regard to the final equilibrium values, since these are attained only after long periods of time. A fall of potential is not to be considered as due to an oxidation of any sort, much less to sulfite (cf. M. and B., *l. c.*). The cause of the difference of potential between a platinized Pt electrode and a developer must be the gaseous H_2 formed in the developer and deposited on the electrode. The electrode potential will be a function of the partial pressure of H_2 on the electrode and of the H^+ conc. in the developer. By detg. the H_2 potential of the same developer in several stages of oxidation, it was shown that the alkalinity of a developer was not affected by its oxidation, at least for hydroquinone. The slowness with which equil. was attained was partly due to

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traces of O_2 acting as a depolarizer in the electrode, the rate at which it was removed, and to a "reaction-resistance" inherent in the developer itself. If the developers were made up *in vacuo*, equil. could be obtained in a week with amidol, but not in 3 months for hydroquinone. The H_2 in the soln. is probably produced by the developer and removed by the Pt black, rather than being produced by the action of the Pt black on the developer at the electrode. The expts. were made with a normal HgCl electrode, a potentiometer and a Weston cell. From the results obtained, the relative reducing powers assigned were as follows: hydroquinone 1.0, metol-hydroquinone 2.7, amidol 36.0, thiourea 53.3. The calcn. of the partial pressure of H to which a developer is equiv. seems to be the only way in which abs. or relative reducing powers may be measured, and the results obtained in this way seem to be photographically probable.

E. B. MILLARD.

Reaction between alkalies and metol and hydroquinone in photographic developers. F. C. FRARY AND A. H. NIETZ. *J. Am. Chem. Soc.* 37, 2273–8(1915).—Calcns. from previous expts. (cf. preceding abstr.) indicate that NaOH and hydroquinone can form either mono- or diquinolates, according to the conditions. With Na_2CO_3 and hydroquinone, in the concns. usually used for developers, most of the developer would combine with the alkali to form monoquinolate if no sulfite were present. In the presence of sulfite the developer distributes itself between it and the alkali. Complete oxidation of a hydroquinone developer may be accomplished without changing its alkalinity. One mol. of metol appears to combine with 3 mols. of NaOH, in the absence of sulfite.

E. B. MILLARD.

Theories of the latent image and reversal. E. P. WIGHTMAN. *J. Phys. Chem.* 19, 571–88(1915).—The nature of the latent photographic image is still unknown. The older purely chem. theories of subhalides have been practically discarded; the present ones, involving solid solns. and colloidal Ag, have some experimental support. The molecular strain theory of Bose does not go far enough, for a change of intrinsic energy does not necessarily imply a strain. Assembling the ideas of various physicochemical theories, it may be said that when light begins to act, electrons are driven off from the AgBr until enough light has acted to start decompn., when the Br leaves the Ag residue dissolved as a solid solution in the surrounding bromide and with a positive electric charge. This may account for the stability of the latent image in presence of HNO_3, and does not imply the initial formation of colloidal Ag. As decompn. proceeds, the electrification of the AgBr may increase by further expulsion of electrons, increasing the electrostatic field to a degree at which an external stimulus may effect recombination and neutralization. The gelatin about the AgBr particle would become satd. with Br, and some of the charged Ag particles resulting from decompn. might find their way to the surrounding gelatin and combine with it. When the plate is developed, an image will result if the exposure exceeds the minimum required to produce the electronic discharge and is less than the amt. required to produce self-neutralization. Just over this amt. electronization may set in again. L. DERR.

Production of duplicate negatives, methods of image reversal, lateral inversion and stripping. VI. E. STENGER. *Z. Reproduktionstechnik* 17, 62–5(1915); cf. *C. A.* 4, 722; 8, 634.—Working directions for the dichromate process, in which an ordinary dry plate is bathed 2–4 min. in 3–4% K_2CrO_7, exposed 2–4 min. in sunlight under the negative to be copied, and, after a long wash (about 12 hrs.) to eliminate the dichromate, developed with a slow developer. A duplicate of the original negative is obtained.

L. DERR.

Pros and cons of some intensification methods. ANON. *Brit. J. Phot.* 62, 870–1(1915).—While all the current methods are useful at times, the only thoroughly reliable ones are these: Hg bleaching followed by development with ferrous oxalate,

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Lumière's Hg physical intensifier, and the Ag and Cr intensifiers; these four do not tend to destroy the original Ag image. Neither of the Hg methods should be used for negatives intended for Pt printing. HgI gives apparently permanent results if a developer is used; U intensification is not permanent under all conditions. L. DERR.

Brit., 13,072, May 27, 1914. J. E. BRANDENBERGER. **Films for photographic and like purposes** consist of two previously prepared outer films of regenerated cellulose enclosing between them a perfectly uniform layer of plastic material, such as gelatin, resin, paraffin, rubber, or mixts. containing oil.

Brit., 13,260, May 29, 1914. J. H. CHRISTENSEN. Processes of reproducing from autochrome and like screens photographs or for producing **color photographs** from sep. component negatives by utilizing films of the kind described in 25,419, 1913 (*C. A.* 9, 1282). These films are made with AgBr or like emulsions which are characterized in that the permeability of the exposed parts is increased by development. The processes are adaptable for cinematography color films when reproducing a multicolor screen transparency.

Fr., 19,604, addition to 467,564, June 27, 1914. J. FRACHEBOURG. Process of rapidly producing **colored designs** by the superimposition of several designs in colors of the same subject. The temporary paper support for the impression of an image is covered first with a film of gelatin which fills the pores of the paper and holds the surface fibers flat, whereupon a layer of wax is applied to the gelatin surface, and after this is dry another layer of gelatin is applied for the reception of a monochrome impression. This impression is then transferred.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

Phototropy of inorganic systems. System calcium sulfide. J.-R. MOURELO. *Compt. rend.* 161, 172–5(1915); cf. *C. A.* 8, 2103; 9, 1145.—Quantities of Mn and Bi ranging from 0.1 to 0.0001 g. per 100 g. of $CaCO_3$ have been added to the prepns. used in making CaS. Phototropy begins with 0.1 g. Mn, and increases as the phosphorescence decreases, *i. e.*, as the % Mn decreases, to 0.0001%. The presence of 2 phosphorogenic substances at the same time increased the sensitiveness of the CaS to light, but had no effect on the color of the phototropic phenomena. The colors ranged from red-violet in the prepn. contg. 0.1% Mn through rose, violet (becoming more and more intense as the % Mn decreased), and finally yellowish and rose. E. B. MILLARD.

Reactions in liquid ammonia. II. Action of acid amides on the amides, imides and nitrides of certain heavy metals. Metallic salts of acid ammono esters. E. C. FRANKLIN. *J. Am. Chem. Soc.* 37, 2279–95(1915); cf. *Ibid* 27, 833(1905); 29, 656 (1907); *Am. Chem. J.* 28, 95(1902); *C. A.* 6, 1410.—The following compds. have been prepd., for the most part in app. which has already been described: *Silver ammonoacetate diammonate*, $CH_3CONHAg.2NH_3$; *thallous ammonoacetate*, $CH_3CONHTl$ and its *diammonate; lead ammonoacetate; silver ammonobenzenesulfonate*, $C_6H_5SO_2NHAg$, and its *mono-* and *diammonates; thallous ammonobenzenesulfonate*, $C_6H_5SO_2NHTl$, and its *mono-* and *diammonates; thallous ammono-p-toluenesulfonate*, p-$CH_3C_6H_4SO_2NHTl$ and its *monammonate; cuprous ammono-p-toluenesulfonate diammonate*, $CH_3C_6H_4SO_2NHCu.2NH_3$; *cupric ammono-p-toluenesulfonate*, $(CH_3C_6H_4SO_2NH)_2Cu$; *cuprous ammonobenzenesulfonate*, $C_6H_5SO_2NHCu$, and the *diammonate; cupric ammonobenzenesulfonate tetraammonate*, $(C_6H_5SO_2NH)_2Cu.4NH_3$, and the *heptaammonate; silver phenyl ammonoacetate*, $CH_3CONAgC_6H_5$, and its *monoammonate; thallous phenyl ammono-*

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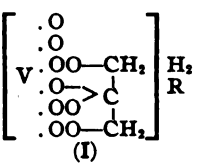
acetate, $CH_3CONTlC_6H_5$; *potassium benzyl ammonoacetate monoammonate*, $CH_3CONK\text{-}CH_2C_6H_5.NH_3$; *potassium p-phenetole* (*p-ethoxyphenyl*) *ammonoacetate*, $CH_3CONKC_6H_4\text{-}OEt$. Amides, imides, and nitrides of the heavy metals were dissolved in liquid NH_3 solns. of acid amides, and the above salts, mostly well crystd., were obtained. The compds. obtained are to be looked upon as salts of an NH_3 system of acids, bases, and salts which are formed by the action of the ammono acids on ammono bases. Such compds. as acetanilide and benzylacetamide are to be looked upon as acid ammono esters which, in liquid NH_3, react with ammono bases, just as the acid amides do, to form ammono salts. E. B. MILLARD.

Complexes of vanadic acid with citric acid. G. A. BARBIERI. Univ. Ferrara. *Atti accad. Lincei* **24**, I, 724–9(1915).—Berzelius first observed the compds. of vanadic acid with organic acids. Ditte (*Compt. rend.* **102**, 1021(1886)) found that V gives a complex $8(NH_4)_2O.3V_2O_5.8C_2O_3.20H_2O$ with $(NH_4)_2C_2O_4$. Rosenheim (*Z. anorg. Chem.* **4**, 369(1893)) found that this compd. has a somewhat different compn. B. (*C. A.* **9**, 617) studied the vanadyl-tartrates but could not satisfactorily isolate the complex compds. Better results with the vanadyl-citrates are described in this paper. On boiling a soln. of NH_4 metavanadate with citric acid a yellowish white cryst. compd. $(NH_4)_2O.V_2O_5.2C_6H_8O_6.2H_2O$ seps. If the K or Na salt is used the corresponding salts sep. These were thought at first to be addition compds. but are really complex compds. This is indicated by their reactions: the NH_4 compd. which is quite sol. in H_2O is little sol. in the presence of NH_4Cl or $(NH_4)_2SO_4$; the NH_4 salt is easily crystd. from concd. solns. by adding NH_4Cl; the same is true for the action of NaCl on the Na salt; the addition of KCl to the NH_4 salt in soln. seps. the K salt; and finally the addition of $AgNO_3$ to the soln. of the NH_4 salt gives a ppt. containing Ag, vanadic acid and citric acid, while citric acid does not give an insol. Ag salt with $AgNO_3$. Since citric acid contains 3 CO_2H groups and 1 tertiary OH and since vanadic acid is insol. in succinic acid solns. it is probable that its soly. depends on the tertiary OH. Further Prandtl (*C. A.* **7**, 3090) found that vanadic acid is sol. in many alcs. and gives especially stable compds. with tertiary alcs. In preceding papers (cf. *C. A.* **9**, 298, 617, 1477, 2849) the existence of complexes of salicylic and tartaric acids involving secondary valences was discussed. In the citrovanadates the structure probably is (I). The prepn. of the neutral Ag salt



(I)

$\left[V\begin{matrix}O_2\\C_6H_4O_6\end{matrix}\right]Ag_3$ is in accordance with this view. 100 cc. of H_2O containing 20 g. citric acid in soln. were treated with 10 g. NH_4 metavanadate at 60–70° and gave a greenish yellow liquid which on cooling seps. *ammonium citrovanadate*, $\left[V\begin{matrix}O_2\\C_6H_4O_6\end{matrix}\right]\begin{matrix}NH_4\\H_2\end{matrix}.H_2O$, yellowish white monoclinic crystals, fairly sol. in warm H_2O, seps. on cooling; when boiled the soln. becomes green, then blue and gives vapors of acetone; the V^V is reduced to V^{IV}. *Potassium citrovanadate*, $\left[V\begin{matrix}O_2\\C_6H_4O_6\end{matrix}\right]\begin{matrix}K\\H_2\end{matrix}.H_2O$, is obtained similarly from K metavanadate or by treating the NH_4 salt with KCl. 11.7 g. NH_4 metavanadate suspended in H_2O + 4 g. NaOH were boiled to remove Na and 21 g. citric acid in concd. soln. were added; *sodium citrovanadate*, $\left[V\begin{matrix}O_2\\C_6H_4O_6\end{matrix}\right]\begin{matrix}Na\\H_2\end{matrix}.H_2O$, seps. as colorless crystals.

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5 g. of the K salt added to 10 g. $AgNO_3$ in 150 cc. H_2O and digested for 12 hrs. gave silver citrovanadate, $\left[V\begin{matrix}O_2\\C_6H_4O_6\end{matrix}\right]Ag_3$, as a white insol. microcryst. powder.

E. J. WITZEMANN.

Formation of alkali metal carbonates. P. MELIKOV AND M. ROZENBLAT. *J. Russ. Phys. Chem. Soc.* 47, 1093–4(1915).—In the calcination of NaCl or KCl with $(NH_4)_2CO_3$ some Na_2CO_3 (or K_2CO_3) is formed. The reaction being reversible, the formation of fixed alkali carbonate may be prevented by adding NH_4Cl from the start. The sulfate of Na or K is not affected by heating with $(NH_4)_2CO_3$. H. M. GORDIN.

Action of potassium hydroxide on atacamite. S. CHUMANOV. *J. Russ. Phys. Chem. Soc.* 47, 1268–9(1915).—Atacamite is converted by KOH into a dark brown *substance* of the approx. compn. $4CuO.H_2O$, while sol. Cu salts ($CuCl_2$, $CuSO_4$) are changed by alkali, according to the conditions, to one or the other of the following *compounds:* $7CuO.H_2O$, $8.5CuO.H_2O$, and $9CuO.H_2O$. H. M. GORDIN.

The formation of isomorphous mixed crystals between cobalt oxide and manganese oxide, and between cobalt oxide and nickel oxide. J. ARVID HEDVALL. Upsala. *Z. anorg. allgem. Chem.* 92, 381–4(1915).—Expts. in which mixts. of CoO and MnO and of CoO and NiO were fused at 1100° and at 1300° with KCl as flux gave products from whose appearance H. concludes that both mixts. form solid solns., though in the 1st case possibly only between the limits 26–76% CoO.

GEORGE W. MOREY.

Spongy appearance of sodium amalgam. ENRIQUE V. ZAPPI. *Anales soc. quim. Argentina* 2, 210–1(1914).—A 20% Na amalgam which had remained for more than 1 yr. in a flask (not well closed) almost completely lost its original metallic appearance and was transformed into a lead-gray colored mass of foliaceous structure. When subjected to the action of H_2O it was decomposed with the pptn. of a greenish gray powder which was identified as Hg_2O; at the same time it assumed a spongy appearance identical with that of NH_4 amalgam. The latter appearance is probably explained by the fact that a portion of the Na of the amalgam became oxidized and hydrated by the continued action of the air and hence was the first to be dissolved in the H_2O; cavities were thereby produced in the mass so that the latter presented the spongy appearance noted. H. S. PAINE.

Iso- and heteropoly acids. XI. Unsaturated molybdic acid arsenates and phosphates. ARTHUR ROSENHEIM AND ADELE TRAUBE. Berlin. *Z. anorg. Chem.* 91, 75–106(1915); cf. *C. A.* 9, 570.—In attempting the systematization of the heteropoly acids, the "type series" is taken as that in which the O atoms in the anion $(XO_6)^m$ or $(XO_4)^n$ are replaced by acid radicals; salts of the "satd. type series" are those in which all the O atoms have been replaced, the group having the max. basicity of the central atom, *e. g.*, $R_7[As(Mo_2O_7)_6]$; the "unsatd. type series," those in which the O atoms are not all replaced, but the group still has the max. valence, *e. g.*, $R_7[As(Mo_2O_7)_6O]$; "unsatd. series," those in which the group does not show the max. valence, *e. g.*, $R_{12}[As_2(Mo_2O_7)_9O_2]$. The formulation of various compds. of the unsatd. series is developed, as a beginning in the application of the Werner-Miolati theory to these more complicated cases. From detns. of "H_2O of constitution" and from cond. detns., it is shown that the 3-molybdic acid arsenates are derivs. of the acid $H_3[As(MoO_4)_3O]$, which is fairly stable even in dil. solns., and is a stronger acid than the parent H_3AsO_4. The 9-molybdic acid arsenates and phosphates are derivs. of an acid of the type $H_6\left[\begin{matrix}(Mo_2O_7)_4 & (Mo_2O_7)_4\\ As & As\\ O-Mo_2O_7-O & \end{matrix}\right]$; by hydrolysis the phosphate of this type yields

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17-molybdic acid 2-phosphate, $H_{22}[P_4(Mo_2O_7)_{17}O_4]$, with 4 nuclei arranged similarly to the above. The reasoning in the above cases is based on detns. of "H_2O of constitution" by heating a little above 100° and on ignition, on cond. measurements, and on the compn. of the salts obtainable; most of the known derivs. of the above acids are "acid salts." Most of the compds. prepd. are not new; the following new compds. are the completely satd. neutral salts: *guanidinium 3-molybdic acid arsenate*, $(CN_3H_6)_3[As(MoO_4)_3O]$, difficultly sol. yellow prismatic needles; *guanidinium 9-molybdic acid arsenate*, $(CN_3H_6)_{12}[As_2(Mo_2O_7)_9O_2].12H_2O$, light yellow-intergrown needles; *cesium 9-molybdic acid arsenate*, $Cs_{12}[As_2(Mo_2O_7)_9O_2].5H_2O$, white needles; *guanidinium 9-molybdic acid phosphate*, $(CN_3H_6)_{12}[P_2(Mo_2O_7)_9O_2].30H_2O$, yellow needles; *silver 9-molybdic acid phosphate*, $Ag_{12}[P_2(Mo_2O_7)_6O_2].20H_2O$, microscopic prisms; *guanidinium 17-molybdic acid 2-phosphate*, $(CN_3H_6)_{22}[P_4(Mo_2O_7)_{17}O_4].40H_2O$, yellowish prisms; *silver 17-molybdic acid 2-phosphate*, $Ag_{22}[P_4(Mo_2O_7)_{17}O_4].40H_2O$, colorless prisms. GEORGE W. MOREY.

The binary system lithium chloride–cesium chloride. E. KORRENG. Berlin. *Z. anorg. Chem.* 91, 194–208(1915).—A study of the fusion diagram of the system LiCl–CsCl by means of cooling and heating curves, supplemented by microscopic exam. Contrary to the findings of Zhemchuzhnucii and R. (*C. A.* 4, 1580), compds. are formed in this system: *cesium chlorolithiate*, LiCl.CsCl, m. p., 351°, anisotropic, not miscible in solid state with LiCl or with *cesium trichlorolithiate*, LiCl.2CsCl, which has an incongruent m. p. at 380° and 41 mol. % LiCl, and exists in 2 enantiotropic forms, with a transition point at 360°. CsCl, m. 635–8°; the inversion α (regular) $\rightleftharpoons$ β (regular) takes place at 479°; LiCl m. 609°, and the LiCl–LiCl.CsCl eutectic is at 332°, 58 mol. % LiCl. GEORGE W. MOREY.

Action of metals on chlorides of carbon (ZAPPI) 2.

7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Progress in the analytical chemistry of the metalloids in 1914. A. GUTBIER. *Chem. Ztg.* 39, 597–8, 622–5, 635, 650–2, 675–8(1915).—A review of methods, with bibliography. J. H. MOORE.

The development of electroanalysis in America. EDGAR F. SMITH. Univ. Penn. *Trans. Am. Electrochem. Soc.* 27, 23–30(1915).—A historical review of S.'s early work in the electrolytic detns. and sepns. of Cu, Cd, U, etc. Tribute is paid to Robert Hare, Gibbs, Genth, and others. C. G. F.

Electrolytic determination and separation of cobalt. E. F. SMITH AND H. S. LUKENS. *Trans. Am. Electrochem. Soc.* 27, 30–4(1915).—Preliminary report of a newly discovered method for pptn. and sepn. of Co. The metal is pptd. as the hydrated "dioxide" on a platinized Pt anode; accuracy is to 0.1 mg. of total wt. of Co. The soln. contains the double fluoride of Co and NH_4 plus a little HNO_3; it is electrolyzed at 2 v. and 0.8 amp. With this soln. no Co goes to the cathode under 8 v. This method is much more accurate than the older methods of detn., electrolytic or otherwise. The "dioxide" is ignited to Co_3O_4 and weighed. If the soln. contains Co and Ni, the latter is pptd. on the cathode. This sepn. is better than the nitrite method. Dimethylglyoxime is not very reliable for the detection of traces of Ni in Co solns. Agitation of the soln. during electrolysis causes poorly adhering Co deposits. HNO_3 prevents the pptn. of any Co on the cathode. HCl is deleterious. Scheme of analysis: dissolve the sulfides of Co and Ni in HNO_3, remove excess of acid by evapn.; dil. and add NH_4F. The anode must be platinized to avoid overvoltage. C. G. F.

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Anodic potentials of silver. II. Their role in the electrolytic estimation of the halogens. J. H. REDDY. *Am. J. Sci.* 40, 400–12(1915).—An exptl. study, reported in detail with cuts of app., tables of results, and curves, on the detn. of the halogens by means of Ag anodes, from which R. concludes: (1) The anodic potential must be known at every stage of the electrolysis, so that the max. value of the potential for that particular process may not be exceeded. (2) In no case may the anodic potential rize above 0.521 v., since Ag dissolves above that potential. (3) The course of the electrolysis cannot be properly controlled by the regulation of the current, independently of the anode potential. (4) Cl cannot be satisfactorily estd. by electrolytic pptn. on Ag, since the anodic potential required for its complete deposition is approx. the same as that at which Ag dissolves. (5) Quant. sepn. of the halogens is possible only within certain definite limits of concn. (Cf. *C. A.* 9, 2838.) F. W. SMITHER.

The recovery of ammonium molybdate used in phosphate estimations. J. A. PRESCOTT. *Analyst* 40, 390–1(1915).—The method suggested is based on the fact that if NH_4 molybdate is boiled with excess of acid, molybdic acid is pptd. All residues including acid liquors from which the yellow phosphomolybdate ppt. has been removed, alk. or neutral liquors obtained by dissolving the yellow ppt. in alkali or NH_4OH and ignited residues are thrown into a large evapg. basin which is kept heated to conc. the liquors. As the liquors are concd. molybdic acid is pptd. and eventually as there is a preponderance of acid residues, a strongly acid, sirupy liquid is obtained from which crystals of $(NH_4)_2SO_4$ or NH_4NO_3 sep. on cooling. A certain proportion of phosphomolybdate seps. out with the molybdic acid. The whole is filtered and the yellow molybdic acid washed with cold water and dissolved in excess of NH_4OH. To the NH_4OH soln. magnesia mixt. is carefully added until no more phosphate ppts. The soln. is filtered, concd. to a small bulk, keeping NH_3 present in excess, and allowed to crystallize. The mother liquors are worked up for further quantities of molybdate and if necessary the crystals obtained are recrystd. When a blue color due to the presence of lower oxides of Mo is produced through allowing the waste liquors to evap. to dryness and overheating it may be removed by the addition of H_2O_2. P. B. D.

A note on the qualitative detection and separation of platinum, arsenic, gold, selenium, tellurium, and molybdenum. P. E. BROWNING. *Am. J. Sci.* 40, 349–50 (1915).—Recent work by a class of about 40 in the application of the scheme of Noyes and Bray (*C. A.* 1, 25, 2543) having shown a marked variation in results, an investigation of the causes was conducted. It showed: (1) that a soln. of tellurous chloride when treated with a sufficient amt. of NH_4OH to form the sol. $(NH_4)_2TeO_3$ and then with $MgCl_2$ mixt. will give a flocky ppt. of $MgTeO_3$ and $(NH_4)_2TeO_3$ not easily sol. in an excess of NH_4OH. (2) H_2SeO_3 when treated with NH_4OH and $MgCl_2$ mixt. tends to give, especially on warming, a cryst. ppt. of $MgSeO_3$ and $(NH_4)_2SeO_3$, also quite insol. under the conditions. (3) A soln. of $AuCl_3$ when treated with NH_4OH gives a ppt. of fulminating Au; and after filtering and washing, Au may be detected both in the filtrate and in the ppt. From these facts it would seem probable that in the attempt to ppt. the H_3AsO_4 as NH_4MgAsO_4, some of the compds. of Au, Te, and Se might ppt. under certain conditions, and not only vitiate the test for As but also partly destroy the delicacy of the tests for Au, Se, and Te. To avoid these difficulties, leave the treatment with $MgCl_2$ mixt. until after the Au, Se, and Te have been removed and detected. On evapg. with Br or HNO_3, the filtrate from the Te, which contains HCl, H_2SO_3, and HI, oxidation of the As and Mo readily takes place, and the pptn. of the As by $MgCl_2$ mixt. can be satisfactorily made. The Mo thiocyanate is easily obtained in the filtrate by acidifying with HCl and adding Zn and KCNS. As a substitute for $H_2C_2O_4$, H_2O_2 in alk. soln. has been found very satisfactory for the pptn. of Au.

F. W. SMITHER.

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Determination of small quantities of silver by cyanide. G. Rebière. *Bull. soc. chim.* 17, 306–9(1915).—The method of Denigès based on adding an excess of 0.1 *N* KCN soln. to the Ag soln., then 5 cc. NH_4OH, a few drops of KI soln. (1:5) and titrating back with $AgNO_3$ soln. till just turbid (due to AgI) has a max. sensibility of about 0.5 mg., using a buret graduated to 0.05 cc. Expts. showed that 0.01 *N* solns. required several drops of $AgNO_3$ to produce a perceptible turbidity. R. increases the sensibility by the use of the indicator in the colloidal state, operating in the dark and directing light through the vessel. The opalescence produced in 100 cc. of H_2O containing 2 cc. of NH_4OH and 1 drop of KI (1:20) by 0.05 cc. of 0.01 *N* $AgNO_3$ is readily noted. *Method:* Place 100 cc. of the Ag soln. to be tested in a bottle with faces ground parallel, add 10 cc. of KCN soln. (0.1 *N* KCN 10 cc., NH_4OH 20 cc., H_2O to make 100 cc.) previously titrated under the same conditions against 0.01 *N* $AgNO_3$. Shake, add 1 drop of KI (1:20), place under a buret graduated to 0.05 cc. containing 0.01 *N* $AgNO_3$, darken room and direct through the soln. parallel rays of light. Any source of light, using a convergent lens, will answer. Add the $AgNO_3$ soln. drop by drop, shaking stoppered bottle after each addition. When the reaction is complete 1 drop of the $AgNO_3$ soln. will produce a bluish opalescence. Deduct 0.05 cc. from buret reading (or 0.054 mg. Ag), the amt. required to produce indicator change. F. W. Smither.

The direct determination of copper in numerous copper ores containing other metals by the rapid electrolytic method. Manso Nakao. *J. Pharm. Soc. Japan* 1915, No. 402, 919.—Detailed expts. are recorded in Japanese and a short bibliography on the subject in English is appended. A sketch of the app. appears in the text. On pp. 1 to 3 a summary in German states that satisfactory deposits of copper in tartaric acid soln. can be obtained with a rotating gauze cathode (A. Fischer's model). N. uses an auxiliary electrode in Hg_2SO_4, 2 *N* H_2SO_4 and aq. Na tartrate soln. to enable him to control the voltage so that the Cu alone will deposit. *Conditions:* Voltage 0.55; r. p. m. 500 to 980; temp. 90°; time 10 to 15 min.; amt. of Cu 0.21 to 0.30 g.; electrolyte 10 g. Na tartrate, 1 cc. HNO_3 and about 120 cc. H_2O. Up to 0.15 g. Cu can be successfully sepd. from Zn, Sb, Pb and Fe''. Large amts. of Fe'' should be reduced by Mg powder. N. claims successful results with malachite, brochantite, chalcopyrite, copper slag and cuprite, advizing, however, neutralization of the acid soln. with NaOH before adding the Na tartrate and HNO_3. E. G. R. Ardagh.

Platinum assaying at the Boss mine. F. A. Crampton. *Min. Sci. Press* 111, 231–2(1915).—A rapid method for the routine analysis of daily samples is as follows: Use 0.5–1 assay tons of pulp, according to the Pt-Pd content. Add an amt. of Ag equal to 15 times the Pt-Pd content to the crucible charge. Fuse at high temp. and cupel Pb button at moderate heat. Part first in dil. and then in concd. HNO_3. Finish assay for Au in the usual way. Pptn. of Pt-Pd is made as follows: Ppt. Ag with a supersatd. soln. of NaCl and filter first with washing and then refilter without washing. Neutralize filtrate with NH_4OH, adding slight excess, and boil. Add HCOOH till soln. is strongly acid and boil 20–30 min. If the Pt-Pd content is high add 10–15 cc. EtOH after the HCOOH. Filter without washing, dry and ignite. Wrap residue in Pb foil and cupel, allowing button to remain 10 min. at high temp. The button is weighed as Pt-Pd. Extreme accuracy is not claimed for the method, but merely an accuracy commensurate with the importance of daily samples. Extreme error is 0.06 per oz. of Pt-Pd. E. W. Boughton.

Assay of cyanide solutions. Lead acetate method. Anon. *Eng. Mining J.* 100, 521–2(1915).—To meet the requirements of a lab. in which a large number of detns. are made daily, certain mechanical manipulations have been applied to the $Pb(OAc)_2$ method. The 10-assay ton charge is measured in a graduate made by cutting a 1 l. cylinder at the 300 cc. mark and breaking a notch out of the rim down to about

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the 275 cc. mark. The exact size of this opening can only be detd. by trial and should be such that when the graduate is rapidly filled to the top the excess soln. will flow out through the notch down to the 292 cc. mark, surface tension holding the liquid above the bottom of the notch. Pour soln. into a tall 600 cc. beaker and place on hot plate, add 30 cc. of satd. $Pb(OAc)_2$ soln. and about 1.5 to 2 g. of Zn dust; when soln. is near b. p. add 50 cc. HCl and boil till clear. Remove sponge with a 6 in. wood paddle, place on an inverted spot plate, squeeze between 2 paddles, shaping into a cube; dry the cube on a hot plate, wrap in a piece of Pb foil about 1.5 in. square and cupel. The results are all that can be desired of the av. soln. assay. F. W. SMITHER.

Determination of chloride and bromide together. ARTHUR MEYER. *Chem. Ztg.* **39**, 708(1915).—Ppt. the mixed halogens with $AgNO_3$ and weigh as usual. Titrate an equal portion with standard $AgNO_3$ and calc. the wt. of Ag (= *a*). The weighed Ag salts minus *a* = the wt. of the halogens (*b*). The factors for multiplying Br and Cl to obtain the equiv. amts. of Ag are 1.3498 and 3.0423, resp. If X = the wt. of Br in the sample, then $b - X$ = the Cl, and $1.3498\ X + (b - X)\ 3.0423 = a$, from which $X = (3.0423\ b - a)/1.6925$. Cf. *C. A.* **1**, 279; **3**, 33, 2278; **5**, 48, 2049, 2380; **8**, 472. J. H. MOORE.

Colorimetric estimation of phosphoric acid. E. RIEGLER. *Bull. Acad. Sci. Roumanie* **2**, 272–5(1914); *J. Chem. Soc.* **108**, II, 368.—The method consists in pptg. the P_2O_5 as NH_4 phosphomolybdate and reducing the ppt. by warming with a soln. of hydrazine sulfate; a blue soln. is obtained, the intensity of the color of which is proportional to the amt. of P_2O_5 present. A comparison soln. is prepd. by dissolving 0.505 g. of $Na_2HPO_4.12H_2O$ in 100 cc. of H_2O; pipet 1 cc. of this soln. into a graduated centrifuge tube, add 1 cc. of HNO_3 (d. 1.125) and sufficient 30% NH_4NO_3 soln. to fill the tube to the 10 mark. Heat the tube till small bubbles appear, add 2 cc. of 3% $(NH_4)_2MoO_4$ soln., close with a rubber stopper, mix by rotating about 10 times and then centrifuge for 2 min. Decant off the clear supernatant soln., add 30% NH_4NO_3 soln., stopper, mix, and centrifuge for 2 min.; decant as before. Wash the ppt. by means of 20 cc. of 2% hydrazine sulfate soln. into a 100 cc. flask and heat to boiling. Cool, make up to mark with H_2O and mix (1 cc. = 0.00001 g. P_2O_5). The soln. to be analyzed is treated in the same manner, and the 2 solns. compared in a colorimeter, and the concn. calcd. The comparison soln. is stated to be quite stable and permanent. F. W. SMITHER.

Simple procedure for the recognition and estimation of metalloids in organic compounds. JOHN A. MANDEL AND CARL NEUBERG. Kaiser Wilhelm Inst. *Biochem. Z.* **71**, 196–213(1915).—The method consists in general of oxidation with concd. H_2O_2. *Phosphorus.* Heat the substance containing P with 3 cc. H_2O, 3 drops concd. HNO_3, 15 cc. 15% H_2O_2 and 0.1 g. $Fe(NO_3)_3$, gently at first, until the H_2O_2 is completely destroyed, add another 15 cc. H_2O_2 and heat until the reaction is complete (gas evolution). Add 3 g. NH_4NO_3 and 50 cc. molybdic soln. and estimate the P as usual. *Sulfur.* Treat the substance with 3 cc. H_2O, several drops concd. HCl and a crystal of $FeCl_3$ and with 4 lots of 20 cc. each of H_2O_2. At the end of the reaction add more HCl and $BaCl_2$ as usual. HNO_3, AcOH or even NH_4OH may be used in place of the HCl. *Halogen.* The oxidation is carried out in AcOH soln. in the presence of $Fe(NO_3)_3$ and $AgNO_3$. *Arsenic.* The compds. containing As are oxidized in the presence of HNO_3 and $Fe(NO_3)_3$. The method is also useful in qual. tests for these elements in org. compds. Since the method does not apply generally, a preliminary test must be made to ascertain its applicability. C. J. WEST.

Acidimetric determination of picric acid and the interatomic change of the indicator methyl red. ST. MINOVICI AND C. KOLLO. *Bull. Acad. Sci. Roumanie* **3**, 61–71 (1914–5); *J. Chem. Soc.* **108**, II, 383(1915).—It is shown that when picric acid is

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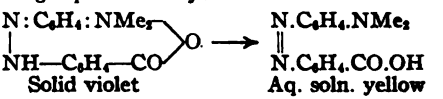
titrated with alkali, using either lacmoid or phenolph. as indicator, an excess of alkali above that theoretically necessary is required to produce the color change. With methyl red, *p*-dimethylaminoazobenzene-*o*-carboxylic acid, the end-point is sharp, and the amt. of alkali required to effect the change agrees with the amt. required theoretically. The reason for the inaccuracy in the former case is that before the soln. changes from yellow to red, it passes through a series of brown tints, while in the case of methyl red the color change is from red-violet to colorless, and consequently the yellow soln. of picric acid changes from the red-violet color sharply to its original yellow color. The color change of methyl red has been examd. by means of measurements of its absorption spectrum in aq. alc. soln., and also in the presence of NaOH and HCl. The results are of a similar nature to those found by Hantzsch for helianthine (*C. A.* **2**, 2259), the change being represented by:



Solid violet — Aq. soln. yellow

F. W. SMITHER.

The refractometric determination of methyl alcohol. FRANZ ADAM. *Oesterr. Sanitätswesen* 1915; *Arch. Chem. Mikros.* **8**, 20–5.—Excellent tables of refractive indices for mixts. of MeOH and EtOH already exist (*J. Am. Chem. Soc.* **27**, 964; *Z. anal. Chem.* 1907, 508). The methods appearing in the trade literature for the detn. of MeOH additions to brandy, rum, toilet prepns., etc., are usually, however, either unreliable or oversensitive. Method: From 100 cc. distil the alc. and det. the sp. gr. of the distillate in the usual way. Read off the g. of alc. in 100 cc. from Windisch's tables and then the refractive index for this amt. of alc. from Wagner's tables. Now read the refractive index at 17.5° with an immersion refractometer. If as little as 1 cc. MeOH in 100 cc. be present the figures of Wagner will be at least 1° higher than those found. If the sample is rich in esters it is safer to distil with alkali, though this is not often really necessary. The presence of esters in the distillate increases the refractive index, while the presence of MeOH lowers it. E. G. R. ARDAGH.

A new method for the determination of toluene in commercial toluoles. D. NORTHALL-LAURIE. *Analyst* **40**, 384–9(1915).—The proposed method is based on the fact that when two chemically similar substances infinitely miscible, such as C_6H_6 and C_7H_8, and which do not form a mixt. of const. b. p., are boiled, the relation between the mol. compn. of the vapor and the mol. compn. of the mixt. is const. As the constituent of lower b. p. boils off, the % of the higher b. p. constituent rizes and so does the b. p. of the mixt. If the relationship between the % compn. and the b. p. is known the amt. of each constituent can be detd. Mixts. of 3 homologs will behave in a similar manner but in this case 2 fractions must be collected to det. the % compn. Mixts. of C_6H_6 and C_7H_8 and of C_7H_8 and C_8H_{10} of known compn. by vol. were prepd. and their b. ps. noted. These were plotted against the percentages and a curve drawn from which the compn. by vol. for all b. ps. could be read off. The method of analysis is as follows: Distil 200 cc. of the sample at a uniform rate of 7 cc. per min. until exactly 50 cc. are collected. Change the receiver and distil over exactly 100 cc. The b. ps. of the first 50 cc. fraction and of the residual 50 cc. are detd. in a b. p. app. of special design. By referring these b. ps. to the graph which accompanies the article the percentages of C_6H_6 and C_7H_8 can be read off. The difference between the sum of these and 100 represents C_8H_{10}. B. p. and stem corrections and a method for the estn. of paraffin are included. P. B. DUNBAR.

Detection of benzene in mixtures. F. FRANK. *Farben-Ztg.* **20**, 1281(1915).—A short discussion of methods depending upon the action of HNO_3 and H_2SO_4 on C_6H_6

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and of those based on the solubilities of asphalt, dragon's blood, etc., and the color of the resulting solns. Dieterich (*Mitteleuropäischer Motorwagen Verein*, No. 18, 42) has recently described the prepn. of a dye, which may be used as a reagent for the detection of C_6H_6 and EtOH in mineral oils. Test paper ("Dracorubinpapier") prepared with the dye turns dark red when immersed in light oils containing C_6H_6 or EtOH.

E. W. BOUGHTON.

Color reactions of trioses and methylglyoxal (NEUBERG) 11B. Apparent specific volumes of alcohol in aqueous mixtures of varying concentration (BROWN) 2.

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8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

Numerical data on the chemical and physical properties of minerals. II. The coefficients of expansion of minerals, rocks, and corresponding artificial products. KARL SCHULZ. Berlin-Lankwitz. *Fortschr. Min. Krist. Petr.* 4, 337–84(1914); continuation of *C. A.* 8, 2861.—A collection of all available information on this subject, with references. E. T. W.

New minerals. ARTHUR SCHWANTKE. Marburg. *Fortschr. Min. Krist. Petr.* 4, 161–74(1914); continuation of *C. A.* 5, 3783, and 8, 2861.—An alphabetical list of 71 minerals, including brief descriptions and analyses of each, and references. Most of these were described during 1913 and the early part of 1914, although earlier ones omitted in the previous lists are included. E. T. W.

Origin and formation of the diamond. W. JOHNSON. *S. African J. Sci.* 11, 275–86(1915).—Diamonds cannot have been formed in molten kimberlite, since it corrodes those already formed, and even in the lowest depths contains a large amt. of H_2O. Moreover, diamonds often have inclusions of hydrated minerals. J. advances the theory that diamonds were formed in the kimberlite, out of "amorphous C or rather a carbonaceous substance," under the conditions of excessive pressure which must have ruled at depth in the pipes, at a relatively low temp., and in the presence of large amt. of H_2O. When the conditions were not such as to form diamonds, graphite resulted; this mineral is sometimes found on, or even in diamonds. J. produced high pressure in expts. by decompn. of dehydrated $H_2C_2O_4$ and H_3PO_4, but best by N obtained from gradual decompn. of $NaNO_2$ and NH_4Cl. W. B. JOHNSON.

A biological hypothesis on the deposition of sulfur during the chalk-sulfur ("gessoso-solfifera") epoch. I. G. BARGAGLI-PETRUCCI. *Atti accad. Lincei* 24, I, 631–8(1915).—B. states that *Bacillus ferrigenus* occurs in certain borax-containing waters rich in Fe deposits, and that springs of Mt. Amiata, which are ozonized (Nasini and Porlezza, *C. A.* 7, 1770), contain a similar microörganism which gives rise to its Fe deposits. But *B. ferrigenus* may also oxidize H_2S and sulfides with the liberation of S (Nasini, *Giorn. bot. ital.* 21 (1914)). Since these bacteria occur so widely in warm fresh and brackish waters B. considers the possibility of accounting for the S deposits in the Larderello, in Sicily, etc., by the action of microscopic organisms on inorganic compds. especially in those epochs in which the temp. was higher. After reviewing the various theories previously proposed for the origin of S deposits, B. points out that the S-bearing sediments also contain the siliceous skeletons of diatoms and suggests that these may have played a role in the formation of the S. Of course the formation of some S by the action of O on H_2S is not excluded. The *Beggiatoaceae* may also play a role. A more careful microscopic exam. of S deposits is to be made. II. *Ibid.*, 761–7.—Some further discussion of the biological hypothesis on the formation of S in these deposits. The effect of the cessation of bacterial growth during the

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winter on the nature of these deposits and the formation of striae in them is considered. Since algae seem to be so definitely associated with the occurrence of the oxidizing bacteria like *Bacillus ferrigenus* in the Italian regions where the Fe and S deposits are now being formed B. suggests that the diatoms may have been similarly associated in past ages. B. discusses certain formations in which this hypothesis does not apply. E. J. WITZEMANN.

The formation of magnesite and its natural occurrence. KARL A. REDLICH. Prague. *Fortschr. Min. Krist. Petr.* 4, 9–42(1914).—Previous work on the origin of magnesite is reviewed at length, and the various types of its occurrence described. Amorphous magnesite forms by decompn. of olivine or serpentine by CO_2-bearing waters; the amorphous character may indicate that these waters were of meteoric origin, but the small amt. of CO_2 therein present seems inadequate to account for the large amts. of this constituent united in vein minerals, and again the amorphous character is in part only apparent, the material being really minutely cryst. Nodules of magnesite found in anhydrite beds have probably been formed by the action of $MgCl_2$ on calcite. Occurrences of magnesite as a gang mineral and as a pneumatolytic formation are described in detail, several new analyses being given, and many previously published ones being tabulated. This type of magnesite is also in part a replacement of limestone. Between magnesite and the other carbonates there are all gradations, and the relations of these carbonates are discussed; the close association of $FeCO_3$ and $MgCO_3$ is of genetic significance. E. T. W.

Mineral resources of Texas. W. B. PHILLIPS. *Bull. Univ. Texas* 365, 320 pp.(1914).—A statement of the deposits of minerals occurring in amts. that make their extn. commercially possible. Their location by counties and the valuation of the substances obtained during the past ten years are included. Analyses of the clays, coals, iron ores, limestones, and mineral waters are also given, as well as other items of commercial interest. R. L. SIBLEY.

Classification of eruptive rocks. II. L. MILCH. Greifswald. *Fortschr. Min. Krist. Petr.* 4, 175–250(1914); continuation of *C. A.* 8, 2863.—An elaborate summary, with discussion, of methods which have been proposed for rock classification. E. T. W.

Petrographic provinces. M. STARK. Czernowitz. *Fortschr. Min. Krist. Petr.* 4, 251–336(1914).—A summary of work in this field, with full bibliography. E. T. W.

The serpentines of Vermont. EDWARD WIGGLESWORTH. *Proc. Boston Soc. Nat. Hist.* 35, 95–107(1915).—The occurrence and petrography of the rocks are described and one new analysis given. The serpentine has probably formed by alteration of a basic igneous rock through the influence of meteoric waters, carrying CO_2 and O, acting at moderate depths. The steatite which is associated with the serpentine seems to be the result of similar action on rocks of slightly different original compn. E. T. W.

Geo-agronomical studies (MARCARELLI) 15. Circular polarization (BERKE) 2. The visualization of the space lattice of crystals by Röntgen rays (LAUE) 2. Iron bacteria (HARDER) 11C.

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9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Efficiency of the blast furnace operation. B. F. BURMAN. *Met. Chem. Eng.* 13, 624–9(1915).—To obtain the max. efficiency in the operation of the blast furnace a

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const. amt. of pure dry air should be supplied under all conditions. While a dry-blast plant is a desirable adjunct to the blast furnace, its installation and operating costs are considerable and in some cases prohibitive. Whether or not the air is dried, as it changes in vol. because of varying temp. and barometric pressure, the speed of the blower must be varied in order to keep the supply of O_2 constant. B. suggests the following formula for detg. the displacement of the blowing cylinder: $V_5 = V_4 - \left[2V_1\left(\frac{459.4 + t}{459.4 + t_1}\right)\frac{P_3}{P}\right]$ cu. ft. V = vol. of air cylinder including the 2 clearances and all the voids. V_1 = vol. of clearances and voids minus vol. of piston rod equal to depth of one clearance. V_2 = vol. of one piston. V_3 = vol. of one piston rod of the length of the stroke plus the depth of 2 clearances. V_4 = vol. of the open space per revolution = $2V - (2V_2 + V_3)$ cu. ft. t = dry temp. (F.) of air entering cylinder. t_1 = dry temp. (F.) of air leaving cylinder. P = barometric pressure. P_3 = blast pressure—absolute (gage + barometer). V_5 = vol. of air mixt. per revolution. Knowing the displacement the operator can construct tables giving the r. p. m. necessary to deliver a given amt. of O_2 at any given temp. or relative humidity.

H. L. OLIN.

Waste-heat boilers in steel plants. C. J. BACON. *Iron Age* 95, 1349–52(1915).—Of the total heat delivered to the open-hearth furnace as fuel gas and combustible elements of the charge, 45% is wasted to the stack. By means of boilers, from $^1/_3$ to $^2/_3$ of this loss may be recovered in the form of steam, or in terms of coal of 11,000 B. t. u., an amt. equiv. to 180 lbs. per ton of ingots. Installation of boilers in connection with open-hearth furnaces in the U. S. alone would therefore save 2,000,000 tons annually. A typical boiler operated with an 85-ton furnace maintained a net output of 386 b. h. p. Among the operating difficulties may be mentioned: (1) air leakage through the brick settings, a source of trouble difficult to overcome; (2) the coating of boiler tubes with fine adherent dust from the furnace; (3) a cost of installation 25% higher than for coal-fired boilers, due to abnormal expense of construction work in cramped quarters, etc.; (4) difficulty in detg. wt. of waste gases to boiler, necessary for proper design of boilers, flues, and fans.

H. L. OLIN.

Refining cyanide precipitates. H. T. DURANT. *Eng. Mining J.* 100, 523–4 (1915).—Ordinary methods of acid treatment of cyanide ppts. fall short of the desired results because all the impurities are not removed. To effect the practically complete removal of foreign substances and the production of high-grade bullion, first carry out the ordinary acid treatment with efficient agitation; then decant or filter off as much as possible of the well-settled Zn soln., leaving all the slimes in the acid-treatment tank; run in fresh H_2O till the total wt. of H_2O is about 5 times the assumed dry wt. of the slimes. While continuously and thoroughly agitating, add separately strong H_2SO_4 and then $K_2Cr_2O_7$ previously dissolved in as little hot H_2O as possible (4 lbs. of 66° Bé. H_2SO_4 to 1 lb. solid $K_2Cr_2O_7$). It is better to keep the contents of the tank heated during this operation. The addition of H_2SO_4 and $K_2Cr_2O_7$ is continued until a small sample of filtered soln., taken from tank 3 or 4 mins. after each addition, shows the presence of H_2CrO_4 and this persists for 1 or 2 mins. The slimes are now washed with H_2O, collected and dried in the usual way and are ready for smelting. NaCl or HCl should not be used in any of the operations. The slimes settle well without any of the usual aids, *e. g.*, glue and alum. Instead of $K_2Cr_2O_7$ the same wt. of $Na_2Cr_2O_7$ may be used; similarly, $KMnO_4$ or $NaMnO_4$ in calcd. equiv. amt. could be used, but it is not so satisfactory. If the treatment with H_2SO_4 and $K_2Cr_2O_7$ is carried too far Ag will begin to be dissolved, but can be recovered from the solns. The finished slimes are heavy and after slight heating to dry thoroughly, will generally appear as annealed Au. Unless much sand is present borax glass is

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the only flux required; it is best to add a little KNO_3 to oxidize any small amts. of C. The finished slimes must be smelted in a clay crucible, and should not be in contact by stirring or otherwise with plumbago or other reducing agent during or before smelting; otherwise a mixed Pb mat may be formed. The final bullion should be practically free from Zn, Pb, and Cu. The extra cost for acid, $K_2Cr_2O_7$ and labor will be more than compensated for by the decreased cost of fluxes in the smelting; by the fact that no light, dusty slimes will be handled; by the saving of time, labor, and fuel in the smelting; and by decrease in the amt. of slag produced. Practically all the bullion will be obtained at once in the bars. F. W. SMITHER.

Gold milling in California—a comparison. LEROY A. PALMER. *Met. Chem. Eng.* 13, 617–24(1915).—A comparative description of 2 modern but radically different plants, the Plymouth Consolidated and the Black Oak, treating somewhat similar ores. In the former, the ore containing both free Au and Au with pyrites, is crushed in a 5 K Gates and reduced to 6-mesh in a mill of 30 1250-lb. stamps arranged in 6 batteries of 5 each. The underflow from the classifiers goes to an 8 ft. by 22 in. Hardinge mill which discharges 15–20% 200-mesh directly into a Hardinge amalgamator. This is essentially a Hardinge mill whose object is to bring coarse or rusty particles into forceful contact with the Hg. The pulp is run over 2 silvered sluice plates and through a launder to 10 table plates. The tailings are concd. and shipped to a smelter. The power expended is 0.7 h. p. per ton. At the Black Oak the ore consisting of quartz gang containing Au with small amts. of Ag, is run through a Blake, fed into 4 5-stamp batteries and crushed in a 4.5 lbs. KCN soln. The pulp is distributed to one simplex and one duplex Dorr classifier from which the coarse product goes to a 4 x 20 ft. tube mill discharging 70% 200-mesh. About 70% of the Au and Ag are in soln. on leaving the mill. The fines from the classifiers are sent to Dorr thickeners which discharge the pulp into a 6 x 12 ft. Oliver continuous filter. Solns. are filter-pressed. Zn dust is used for pptn. Power consumption is 2.55 h. p. per ton. In 1914 costs were $2.24 per ton. In the absence of detailed costs from the Plymouth, comparisons can only be tentative but tailings losses and smelter charges alone are 80 cents per ton. It is to be noted that there is a tendency toward cyaniding the concentrates and Wilfley tailings. H. L. OLIN.

The Newnam hearth. W. E. NEWNAM. *Bull. Am. Inst. Mining Eng.* 1915, 2139–45.—With galena concentrates of 68% Pb or over, the American hearth will produce metal at a lower cost than by sintering and blast-furnace smelting. The disadvantages are that the hearth can be only 4 to 5 ft. long, that two men are required to each furnace, that the work is hot and laborious, that the men are exposed to fumes, and consequent lead poisoning and that the dust and fume are especially large. N. has devized a furnace of which the features are a double hood which disposes of dust and fume, a mechanical rabbler, and a lead-well attachment, which casts the pig with comparatively little attention. The hearth is made 8 ft. long. The rabble operates in one direction only. After its journey through the charge, requiring 12 sec., it is automatically withdrawn from the fire, and also moved 4 in. for the next stroke. By action of a clutch, it is then returned to its original position ready for the next trip. In the case cited about 37 trips were made per hr. During the trip, a helper follows close behind the rabble arm, pushing back the loose charge and picking out the gray slag with a long-handled shovel. Close behind him follows the charger, who spreads a thin layer of ore on the charge with coke breeze as needed. More than twice as much ore can be treated on the 8 ft. hearth as compared with the 4 ft. hand hearth, and the percentage of coke breeze required is less than half. The amt. of dust and fume is much diminished. A convenient method of pugging the dust and fume for mixt. with the ore charge, has also been devized. E. WALLER.

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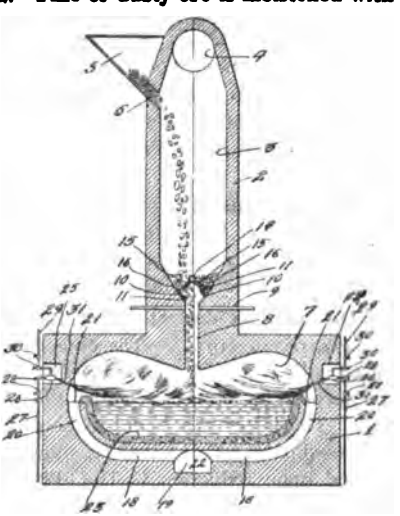
Roasting of copper-nickel ores. H. MANZ. Berlin. *Chem. Ztg.* **39**, 693–4 (1915).—Sulfide ores contg. 6.6% Cu, 11.1% Ni and 32.4% Fe roasted direct in lots of 0.5–5.0 kg. gave 20–40% of the Cu and 22–6% of the Ni sol. in H_2O. When mixed with Fe_2O_3, SiO_2 or roasted residues the % Cu extd. was nearly doubled; the % Ni was scarcely changed. Allowing the moist roast to stand 3 days only slightly increased the H_2O-sol. part. By roasting at the lowest possible temp. (under 600°) with 20% NaCl and stopping at the right point about 90% of the Cu and Ni is sol. in H_2O, and only about 10% of the Fe. The time averaged about 24 hrs. The results are tabulated. J. H. MOORE.

The new mill of the Daly West Milling Co., Park City, Utah. L. O. HOWARD. *Met. Chem. Eng.* **13**, 597–602(1915).—H. describes in detail the layout of the new plant finished in 1915. The milling ores assay 18 Pb, 9 Zn and 2% Cu. There are 5 levels. At the top are the receiving bins; on the 4th floor are 2 Franz jigs above which are the feeding trommel and Akins classifier. The roughing Wilfleys, Harz jigs, Sherman tanks and regrinding mills occupy the 3rd floor, below which are 8 concn. tables and the flotation plant. The Harz tailing jig and concentrate launders are on the first floor. Ground plans and a flow sheet are included. H. L. OLIN.

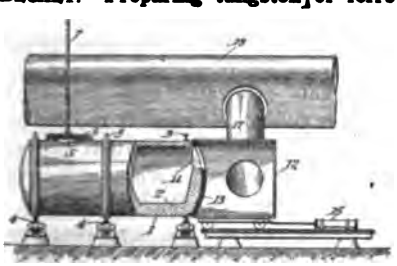
Production of zinc oxide from low grade carbonate ore **26**. Copper leaching (RICKETTS, *et al*) **4**.

U. S., 1,153,203, Sept. 14. L. C. DREFAHL. **Fine or dusty ore** is moistened with $FeSO_4$ soln. and formed into a plastic mass, pressed through perforations and broken into small nodules and the latter are heated on a conveyer belt to expel the moisture and prep. them for desulfurization. Sulfide ores of Zn or Ag are especially adapted to the process.



U. S., 1,153,561, Sept. 14. O. P. MOORE. **Oil-burning smelting furnace.** The smelting chamber *7* is heated by oil burners, *26*, and the material under treatment is fed down from the hopper *5* through the preheating chamber *3* and shaft *8* onto the refractory furnace lining *23*. A draft is maintained downwardly through the passages *8* and *22*. *10*, *11* and *14* are grate rods. *24* is a flue connection.

U. S., 1,153,594, Sept. 14. F. M. BECKET. **Preparing tungsten or ferrotungsten from ores.** Low-P ores of the Ca tungstate type are mixed with Fe tungstate ore, after heating the Ca tungstate ore and treating it with concd. H_2SO_4 to form a stiff paste to increase the % of W as compared to P, and the mixt. is smelted to form a low-P alloy.



U. S., 1,153,921, Sept. 21. W. H. HOWARD. **Converter for treating copper mat.** The converter *1* is mounted to rotate on its horizontal axis and smoke and gases are

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drawn from it through the outlet *11* into a non-rotating shell, *12*, with a H_2O-jacketed wall, *13*, and discharged into the flue *18*. The shell may be detached from the converter when desired.

Brit., 12,654, May 22, 1914. W. R. FELDTMANN. **Auriferous carbonaceous material, after treatment with cyanide, is further treated with a soln. of alkali sulfide or hydrosulfide. Gold is pptd. from the resulting soln. by Cu or Cu_2S.**

Brit., 12,762, May 23, 1914. W. G. NICHOLS. **Manganese steel.** See U. S., 1,100,905 (*C. A.* 8, 2866).

Brit., 12,916, May 26, 1914. J. B. HERRESHOFF. **In bessemerizing copper mat** silicious material is introduced into the converter, upon the molten charge, in excess of the quantity required to slag or flux the charge, the excess silicious material becoming heated and retaining its original capacity for collecting bases. The blister Cu or white metal is tapped from under the slag, and the excess silicious material utilized, while still heated, as a fluxing and slagging medium for the subsequent charge of molten mat, which is introduced into the converter. The excess siliceous material may be introduced in such amt. as to form a thick viscous mass upon the mat, the discharge of the blister Cu or white metal from beneath the mass being thereby facilitated.

10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

Optical rotation of alkali caseinates. M. A. RAKUZIN AND R. S. LOGUNOVA. *J. Russ. Phys. Chem. Soc.* 47, 1059–61(1915).—Pure alkali caseinates, prepd. by Robertson's method, showed the following sp. rotations: Li —114.28°, NH_4 —129.85°, Na —145.36°, K —156.62°, showing the rotation to increase with the at. wt. Since so far only naphtha fractions are known to show an increase of rotation with the sp. gr., the rotation of the salts of aspartic acid, leucine and tyrosine is being examd. by R. and L. H. M. GORDIN.

Thermal analysis of the system dimethylpyrone–trichloroacetic acid. V. A. PLOTNIKOV. *J. Russ. Phys. Chem. Soc.* 47, 1062–4(1915).—An exam. of the solidification curve of 38 mixts. of dimethylpyrone and CCl_3CO_2H completely corroborated the results previously obtained by another method (*C. A.* 9, 2513). H. M. GORDIN.

Desoxins as derivatives of furane. I. I. KOTYUKOV. *J. Russ. Phys. Chem. Soc.* 47, 1087–93(1915).—The object of the work was to det. the number of Ph groups united with 1 mol. of cellulose (*a*) or glucose (*b*) in their desoxins (*C. A.* 8, 2552). For this purpose (*a*) was treated with PhCl and the amt. of Cl in the resulting *chlorodesoxin* detd. The latter was found to be $C_{30}H_{14}O_4(C_6H_4Cl)_2$, gray, amorphous powder, gives upon oxidation *p*-$C_6H_4ClCO_2H$, showing the (*a*) residue to be in the *p*-position to the Cl, and upon reduction $C_{30}H_{14}O_4Ph_2$ (Nastyukov, *Diss.*, "Condensation of Carbohydrates with Cyclic Hydrocarbons"). Similarly with PhBr (*a*) gave the *bromodesoxin*, $C_{30}H_{14}O_4(C_6H_4Br)_2$, yellow, amorphous powder, turning greenish in the air. Detns. of the I nos. of the desoxins of (*a*) and (*b*) showed them to contain 1 double union, while their destructive distn. gave CH_2Ph_2 and *diphenyldihydrofurane* (cf. Thiele, *Ann.* 306, 210), plates, m. 52°, sol. in most org. solvents, gives BzH upon prolonged exposure to the light. The position of the Ph in this compd. K. expects to det. by synthesizing it from $Ph_2C{:}CHCHO$ and CH_2BrCO_2Et. The investigation proves that for 3–4 monomers of (*a*) or (*b*) in their desoxins there are only 2 Ph groups both of which are linked to the same C atom (formation of CH_2Ph_2). H. M. GORDIN.

Hexylisoamylcarbinol. I. VANIN. *J. Russ. Phys. Chem. Soc.* 47, 1094–101 (1915).—Continuing his work on the action of $NiCO_3$ on chlorohydrins (*C. A.* 8, 320),

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V. prepd. *hexylisoamylcarbinol* (*a*) from $C_5H_{11}Br$, enanthaldehyde and Mg; thick liquid, b_{20} 130–3°, solidifies in NaCl + ice (in 1 expt. it refused to do so), d_0^0 0.8392, d_0^{20} 0.8255, reacts with PhNCO, forming a cryst. product. Together with (*a*) some $C_7H_{15}OH$ (Wagner, *J. Russ. Phys. Chem. Soc.* 16, 328) was obtained and converted into its acetate. Gaseous HCl converted (*a*) into the *chlorohydrin* $C_{12}H_{25}Cl$ (not pure), b_{14} 118–9°. The latter was changed by $NiCO_3$ to the *hydrocarbon*, b_{738} 204–5°, either 2-methyl-4-undecene, $Me(CH_2)_5CH:CHCH_2CHMe_2$, or 2-methyl-5-undecene, $Me(CH_2)_4CH:CH(CH_2)_2CHMe_2$. Hence the reaction with $NiCO_3$ may be regarded as general. H. M. Gordin.

1,2-Diphenylcyclopropane from benzylideneacetophenone. N. Kizhner. *J. Russ. Phys. Chem. Soc.* 47, 1102–11(1915).—With N_2H_4 PhCH:CHBz reacts to form *3,5-diphenylpyrazoline*, $PhCH{:}CH_2.CPh{:}N.NH$ (*a*), square crystals, m. 88°, readily oxidizes in the air with evolution of much heat; *hydrochloride*, $C_{15}H_{14}N_2.HCl$, square plates, m. 220–1° (decompn.), is not affected by boiling alc. HCl; *nitroso compound*, $C_{15}H_{13}N_3O$, golden yellow needles, m. 140° (decompn.). The catalytic decompn. of (*a*) by KOH + platinized porous plate gave *1,2-diphenylcyclopropane* (*b*), b_{741} 307.5°, $b_{9.5}$ 149°, does not solidify at —25°, d_4^{20} 1.0317, n_D 1.5967. Though the MR 64.01) of (*b*) corresponds to a compd. with 7 double unions (MR = 64.19), its formation and reactions show it to be (*b*). It is only very slowly attacked by $KMnO_4$, and not at all by H_2SO_4 in alc., while with Br it gave a thick liquid, *dibromide*, probably $CH_2(CHBrPh)_2$. HBr reacts with (*b*) to form PhCMe:CHPh (*c*) and *1,1-phenylbenzylethylene*, $PhC(:CH_2)CH_2Ph$ (*d*), long prisms or 6-sided plates, m. 48°. That (*d*) is not a stereoisomer of (*c*) was shown by its remaining unchanged by crystn. in presence of traces of Br or I. By heating with HBr in AcOH (*c*) and (*d*) are mutually convertible into each other. It is supposed that in the conversion of (*d*) into (*c*) an intermediate product, $PhCBrMeCH_2Ph$, is formed, while in the reverse change the intermediate product is the *bromide* $PhCH(CH_2Br)CH_2Ph$, m. 158°. The latter was isolated. H. M. G.

Trimethylethylmethane from pinacolin. N. Kizhner. *J. Russ. Phys. Chem. Soc.* 47, 1111–3(1915).—Me_3CCOMe slowly reacts with N_2H_4 to form the *hydrazone* $Me_3CC(:NNH_2)Me$, b_{740} 162°, is decompd. by warm HCl and converted by KOH + Pt in sealed tube into Me_3CEt, b_{738} 49°, d_4^0 0.6667, d_4^{20} 0.6486, n_D^{20} 1.3704. H. M. G.

Reaction of esters with iodomagnesium alcoholates. G. L. Stadnikov. *J. Russ. Phys. Chem. Soc.* 47, 1113–21(1915).—It was previously shown (*C. A.* 9, 1755) that iodo-Mg alcoholates react with certain esters, replacing the alc. radicals of the latter with the alc. radicals of the alcoholates used. This method is very convenient for prepg. esters of the higher alcs. For this purpose MeMgI or EtMgI is converted by means of the higher alc. into the corresponding iodo-Mg alcoholate, and the latter brought into reaction with the Me or Et ester of that acid whose higher ester is wanted. The bromo-Mg alcoholates may turn out to be preferable to the I compds., since with the latter the higher esters always are contaminated with some high boiling iodides which are removable only by exposing the esters to the light for 7–8 days and washing them with dil. aq. alkalies, or by distg. them with finely divided Cu (Naturkupfer). This method of prepg. esters is particularly satisfactory where Houben's method (*Ber.* 39, 1736), on account of inaccessibility of the acid chlorides or anhydrides required in his method, is inapplicable. With respect to the nature of the radicals capable of replacing each other in S.'s method, it was found that with the approach of an alc. to the phenolic state its radical becomes less capable of replacing more positive alc. radicals in esters. While usually the heavier radical replaces the lighter one, the reverse takes place when the difference in mass is not great and the lighter radical is the more positive. With increasing mol. wt. of the acid underlying an ester the ability of the latter to ex-

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change its alc. radical for a heavier one seems to diminish. Thus the replacement of Et by menthyl is slower and the yield of higher ester poorer with BzOEt than with AcOEt or $EtCO_2Et$. Unlike alcs., the iodo-Mg alcoholates do not react with amides to form esters. Menier's iodo-Mg compds. of secondary amines (*Compt. rend.* **136**, 758) react neither with amides nor with esters. Under certain conditions S.'s method yields ethers instead of esters (cf. following abstr.). Of the numerous esters described the following are new: *Menthyl iminodiacetate*, $C_{24}H_{43}NO_4$, from iodo-Mg mentholate (*a*) and Et iminodiacetate (S., Amino, Imino and Nitrilo Acids, 1910), m. 48–50°, b_{14} 263°, could not be recrystd. *Menthyl nitriloacetate*, $C_{26}H_{45}NO_6$, from (*a*) and Et nitriloacetate, m. 80–1°. With iodo-Mg phenolate, AcOEt (*b*) did not react, nor could the iodo-Mg alcoholate of Ph_2CHOH (*c*) be made to react with menthyl benzoate, while the reaction of the iodo-Mg alcoholate of terpineol (*d*) with (*b*) gave the hydrocarbon $C_{16}H_{16}$, b_{760} 182–4°, showing that (*d*) was merely dehydrated. From the reaction product of $AcOCHPh_2$ and (*a*) menthyl acetate could not be isolated, but the liberation of (*c*) was established. H. M. Gordin.

Formation of plain and mixed ethers in the interaction of iodomagnesium alcoholates with esters. G. L. Stadnikov. *J. Russ. Phys. Chem. Soc.* **47**, 1122–5(1915). —In a former article (*C. A.* **9**, 1754) it was stated that $AcOCPh_2$ reacts with alkyl-Mg halides to form $(Ph_2CH)_2O$ (*a*). It is now shown that with iodo-Mg alcoholates the reaction may yield both plain and mixed ethers. Thus the action of the iodo-Mg alcoholate of Ph_2CHOH (*b*) on AcOEt (*c*) gave (*a*) and $EtOCHPh_2$, while replacing (*c*) with BzOEt in this reaction resulted in the formation of (*a*) and liberation of (*b*). The ethers formed in this reaction cannot be regarded as normal products, as is the case with esters of inorg. acids (Rabtzevich-Zubkovskii, *C. A.* **6**, 1431), because they appear only in exceptional cases, the reaction usually consisting in an exchange of the alc. radical of the ester for the alc. radical of the alcoholate used. Besides, if the ethers were normal products of the reaction, the 2 reactions: AcOR + R'OMgI, and BzOR' + ROMgI, ought always to give ROR', whereas the 1st reaction gives AcOR', while the 2nd in some cases does not go at all (cf. preceding abstr.). Then again the assumption that ethers are produced normally in this reaction fails to explain why the formation of ethers is facilitated by an elevation of temp. The best explanation is that the chief reaction: AcOEt + $Ph_2CHOMgI$ = $AcOCHPh_2$ + EtOMgI, giving higher esters, may be accompanied by the following reactions: $AcOCHPh_2$ + MgI_2 = AcOMgI + Ph_2CHI (*d*); Ph_2CHI + $Ph_2CHOMgI$ = $(Ph_2CH)_2O$ + MgI_2; $AcOCHPh_2$ + EtOMgI = AcOMgI + Ph_2CHOEt. The presence of MgI_2 in Grignard's mixt. accounts for the formation of (*d*), which is facilitated by elevation of temp., and the const. regeneration of MgI_2 accounts for the fact that a small amt. of it suffices for the production of ethers. H. M. Gordin.

Condensation of ethyl acetonedicarboxylate with aldehydes and ammonia or amines. P. Petrenko-Kritchenko. *J. Russ. Phys. Chem. Soc.* **47**, 1126–32(1915).—It was formerly shown that acids convert $CO.CH_2.CHPh.NPh.CHPh.CH_2$ (*a*) into $CO(CH{:}CHPh)_2$ (*b*) with elimination of $PhNH_2$. As this reaction resembles Hofmann's reaction of exhaustive methylation, it may be supposed that the change of (*a*) to (*b*) is accompanied by formation of the intermediate product $PhCH{:}CHCOCH_2CHPhNHPh$. In order further to study this reaction, several compds. related with γ-piperidone were prepd. and examd. The condensation of $CO(CH_2CO_2Et)_2$ (*c*) with Me_2CHCHO + NH_3 gave the *base*, $CO.CH(CO_2Et).CH(CHMe_2).NH.CH(CHMe_2).CHCO_2Et$, m. 57°, is colored red by alc. $FeCl_3$; *hydrochloride*, m. 157°; orange-red *chloroplatinate*, $(C_{17}H_{29}NO_5.HCl)_2PtCl_4$; *nitrite*, $C_{17}H_{29}NO_5.HNO_2$, cryst., m. 106°, gives Liebermann's reaction, is readily oxi-

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dized by CrO_3 in AcOH, but the yield of oxidation product is very poor, only an insignificant amt. of a substance m. 243° being obtainable from it. The condensation of (*c*) with BzH + $PhCH_2NH_2$ gave a small amt. of a substance m. 105–20° and the *diamine*, $CO[CH(CO_2Et)CHPhNHCH_2Ph]_2$, (*d*), m. 122–4°; *hydrochloride*, m. 140–92°. In some attempts to recryst. (*d*) it changed to what seems to be the *γ-piperidone compound*, $CO.CH(CO_2Et).CHPh.N(CH_2Ph).CHPh.CHCO_2Et$, probably with elimination of $PhCH_2NH_2$, rhombs, m. 90°. Sometimes this change was accompanied by the formation of a substance m. 220–30°. From the mother liquor of the previously described condensation product of (*c*) with BzH + NH_3 a compd. m. 190–200° and the *triamine*, either $NH:C[CH(CO_2Et)CHPhNH_2]_2$, or $NH_2CHPhCH(CO_2Et)C(NH_2):C(CO_2Et)CHPhNH_2$, m. 160°, were obtained. When the soln. of this compd. in C_6H_6 is satd. with HCl a *hydrochloride*, m. 200°, seps. out which upon soln. in H_2O and treatment with NH_3 changes to the *diamine*, $CO[CH(CO_2Et)CHPhNH_2]_2$, m. 112°, with elimination of NH_4Cl. This diamine, unlike the triamine from which it is produced, is colored red by alc. $FeCl_3$. H. M. Gordin.

A synthetic open chain terpene glycol. Vrr. Longinov. *J. Russ. Phys. Chem. Soc.* 47, 1132–44(1915).—As follows from his former investigation (*C. A.* 9, 1899), L.'s method of reducing the esters of tribasic acids gives glycols $RCH(CH_2OH)CH_2CH_2OH$. If R be $Me_2CHCH_2CH_2CH_2$, the compd. will be a deriv. of 1,2-dimethyloctane underlying the aliphatic terpenes. Such is *β-isohexyltetramethylene glycol*, or *bupleuroglycol* (cf. Francesconi and Sernagiotto, *C. A.* 7, 2221), $Me_2CHCH_2CH_2CH_2CH(CH_2OH)CH_2CH_2OH$ (*a*), odorless (when perfectly pure, otherwise smells like lemon oil) liquid, b_9 160°, d_4^{20} 0.9277, n_{20} 1.4555. The prepn. of (*a*) is as follows: The reduction of Me_2CHCO_2Et gives $Me_2CHCH_2CH_2CH_2OH$ (Rossi, *Ann.* 133, 180), b_{747} 151–2°, d_4^{20} 0.8156, n_{20} 1.4142, smells like iso-AmOH, is converted by P + I into *isohexyl iodide*, mobile liquid of agreeable odor, b_{769} 172–4° (slight decompn.), b_{28} 69.5–70°, d_4^{20} 1.4283, n_{20} 1.4892. By heating the iodide with $NaC(CO_2Et)_2CH_2CO_2Et$ *ethyl isohexylethenyltricarboxylate*, $Me_2CHCH_2CH_2CH_2C(CO_2Et)_2CH_2CO_2Et$ (*b*) was obtained; thick liquid, b_9 172°, d_4^{20} 1.0127, n_{20} 1.437. Sapon. of (*b*) gives *isohexylethenyltricarboxylic acid*, $C_{11}H_{18}O_6$, m. 141°, is difficult to purify on account of readily losing CO_2. At 60° the acid changes to *isohexylsuccinic acid*, $C_{10}H_{18}O_4$, bundles of long needles, m. 73–4°. The reduction of (*b*) gives (*a*). With Ac_2O (*a*) gives an *acetate*, $C_{14}H_{26}O_4$, thick liquid, b_9 151–2°, d_4^{20} 0.966, n_{20} 1.4369. On boiling with 60% H_2SO_4 (*a*) is dehydrated to the *oxide*, $Me_2CHCH_2CH_2CH_2CH.CH_2.CH_2.O.CH_2$, mobile liquid of a lemon oil odor, b_{748} 204°, d_4^{20} 0.8562, n_{20} 1.436. To the presence of this oxide is due the odor of impure (*a*). The oxide being a deriv. of furane, it is shown that all the β-derivs. of the latter have higher b. p. than its α-derivs. This is due to the fact that the former are derived from the higher boiling diprimary glycols, while the alc. groups concerned in the formation of α-oxides are not all primary. The correctness of F. and S.'s formula for bupleurol could be tested by comparing its dehydration product with the product of complete dehydration of (*a*). Both ought to be the same β-isohexylbutadiene. H. M. Gordin.

Tri- and pentamethylenebis-(α-imino acids). N. A. Shlezinger. *J. Russ. Phys. Chem. Soc.* 47, 1160–83(1915).—Continuing his work on the stability of polymembered rings (*C. A.* 9, 2067, 2068), S. prepd. and examd. several tri- and pentamethylenediimino acids and some of their derivs. As before, the Cu salts were found to be monomol. and very stable, thus corroborating his former statement that at least for such salts Baeyer's, Chugaev's and Werner's assumption of the instability of monomol. compds. with more than 5 members to the ring does not hold good. The above

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2 classes of acids resemble each other but differ from the ethylene acids previously described in that they are easily sol. in H_2O and that their nitriles are much more readily saponifiable. The Cu salts of the trimethylene acids resemble those of the ethylene acids in color (usually bright or dark blue) and in being sol. but unionized in H_2O, while the Cu salts of the pentamethylene acids usually have a violet or rose-color and are almost insol. even in hot H_2O. The method and materials used in making the compds. here described are indicated in the abstrs. referred to above. *Trimethylenebis-[α-iminoisobutyronitrile]*, $CH_2[CH_2NCH(CN)Me_2]_2$, transparent plates, m. 91–2°; *hydrochloride*, $C_{11}H_{20}N_4.2HCl$. The *acids*, $C_{11}H_{22}N_2O_4.2H_2O$, very thin, matted threads, and $C_{11}H_{22}N_2O_4.H_2O$, cryst.; neither is changed by heating to 360°; *copper salt*, $C_{11}H_{20}N_2O_4.3H_2O$, dark blue rhombs, turns violet upon drying, only partly pptd. by alkalies, the other part remaining in soln. and coloring it dark blue. *Trimethylenebis-[α-iminophenylacetonitrile]*, rhombs, cakes 96°, m. 97–8° (sealed capillary). The *acid*, $C_{19}H_{22}N_2O_4$, cryst., does not m. 300°, becomes yellow above 250°; *copper salt*, $C_{19}H_{20}N_2O_4Cu.H_2O$, dark blue needles, darkens upon drying. *Methyl ester*, $C_{21}H_{26}N_2O_4$, cryst., m. 66.5–8.5°; *hydrochloride*, cryst. *Ethyl ester*, $C_{23}H_{30}N_2O_4$, transparent obtuse plates, m. 42.8–3.8°; *hydrochloride*, begins to decomp. 200°, cakes and turns yellow but does not m. 230°. *Trimethylenebis-[α-iminooctanonitrile] hydrochloride*, $CH_2[CH_2NHCH(CN)C_6H_{12}]_2.2HCl$, powder, begins to decomp. about 185°, m. 215–30°. The *acid*, $C_{19}H_{28}N_2O_4$, insol. in H_2O, sol. in HCl; *hydrochloride*, cryst., does not m. 230°; blue *copper salt* and oily *methyl ester*. *Pentamethylenebis-[α-iminophenylacetonitrile] hydrochloride*, $CH_2[CH_2CH_2NHCH(CN)Ph]_2.2HCl$, decomp. 141°. The *acid*, $C_{21}H_{28}N_2O_4$, cryst., unchanged at 300°; *sulfate*, cryst.; *hydrochloride*, $C_{21}H_{28}N_2O_4.2HCl.H_2O$, loses H_2O and HCl at 105°; *copper salt*, $C_{21}H_{24}N_2O_4Cu.2H_2O$, blue crystals, is decompd. by hydrolysis, becoming more sol. in dil. alc.; *nickel salt*, $C_{21}H_{24}N_2O_4Ni$, pale gray greenish powder; *ethyl ester*, light yellow oil, d_4^{20} 1.0775, n_{20} 1.5247; *methyl ester*, extremely thick oil, d_4^{20} 1.1087, n_{20} 1.5353. *Pentamethylenebis-[α-iminopropiononitrile]* was obtained as the hydrochloride and sapond. to the acid, $C_{11}H_{22}N_2O_4.H_2O$, cryst., unchanged at 300°; *hydrochloride*, decomps., turning yellow, when heated; blue *copper salt*, $C_{11}H_{20}N_2O_4.1.5H_2O$, freshly prepd. probably contains 2 H_2O, turns rose-colored on drying; *methyl ester*, b_{14} 193°, d_4^{20} 1.0216, n_{20} 1.4533, gives a *hydrochloride*, powder, decomps. 173°. *Pentamethylenebis-[α-iminoisobutyronitrile]*, m. 46–7°; *hydrochloride*. The *acid*, $C_{13}H_{26}N_2O_4.H_2O$, cryst., unchanged at 360°; *hydrochloride*, powder, evolves HCl at 150° but does not m. 200°; *methyl ester*, mobile liquid, b_{14} 193°, d_4^{20} 1.0035, n_{20} 1.4538, gives a hygroscopic *hydrochloride*. This acid forms 2 *copper salts;* a blue *acid salt*, $3C_{13}H_{24}N_2O_4Cu.C_{13}H_{26}N_2O_4$ (*a*), sol. in H_2O, and an insol. violet *salt*, $C_{13}H_{24}N_2O_4Cu$ (*b*). As shown by the lowering of the f. p., (*a*) in H_2O is completely decompd. into (*b*) and free acid. Since (*b*) is insol., the solubility of (*a*) is difficult to explain, the more so that a soln. of the free acid does not dissolve (*b*), and that when 3 mols. of the latter and 1 mol. of the acid are dissolved in an NH_3 soln. and the NH_3 is removed by evapn., (*b*) seps. out. Tentatively S. explains the solubility of (*a*) by assuming that the (*b*) in (*a*) is stereomeric with free (*b*). H. M. GORDIN.

Supposed instability of imino acids of high molecular weight. N. A. SHLEZINGER. *J. Russ. Phys. Chem. Soc.* 47, 1183–90(1915).—Finding it impossible to sapon. $PhCH(CN)NHCH(CO_2Et)Ph$ (*a*) to *diphenyliminodiacetic acid*, $NH(CHPhCO_2H)_2$, (*b*) by means of HCl, Stadnikov (Amino, Imino and Nitrilo Acids, Moscow, 1910) assumes that in general the stability of imino acids decreases with increasing mol. wt. caused by accumulation of "heavy" (Ph) radicals. Since, however, as Sh. shows, (*a*) can be sapond. to (*b*) by replacing the HCl with concd. H_2SO_4, and since (*b*) was found to be perfectly stable, St.'s assumption is untenable. The real reason why the more dil. HCl is ineffective in sapong. (*a*) is that the proximity of the negative Ph groups

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to the NH diminishes the basicity of the latter, making (*b*) seem unstable unless there be much strong acid in soln. We may assume that the 1st step in the sapon. of esters of the type of (*a*) consists in the NH group taking up a mol. of H_2O and changing to hydrates containing the group $>NH_2OH$ and reacting with acids to form salts. In absence of much acid the sapon. proceeds according to the equation given by St.: $RR'C(NHR'')CN + H_2O = RR'CO + HCN + R''NH_2$, but with much acid the concn. of hydrate is greatly reduced, while that of salt increases, and the sapon. then proceeds with formation of acids of the type of (*b*). The same diminished influence of distant negative groups on the basicity of NH groups is the cause of the ready sapon. of tri- and pentamethylene acids in which the negative CN groups are further from the NH than in the difficultly saponifiable ethylene acids (cf. preceding abstr.). It is possible that the great difference in the solubility of these 2 classes of acids is also due to this cause, the proximity of CO_2H to NH interfering with the solubility. (*b*) forms needles or warts, m. 199° (in a capillary); obtained by decompg. its *hydrochloride*, (*b*) contains 1 mol. of H_2O of hydration; green *copper salt* and yellowish green *nickel salt*, $C_{16}H_{12}NO_4Ni.3H_2O$; *methyl ester*, sirupy liquid, d_4^{20} 1.155, n_{20} 1.5413. H. M. G.

Dipyrryldiphenylmethane, pyrryldiphenylcarbinol and a new pyrrole dye. V. V. Chelintzev, B. B. Tronov and A. P. Terent'ev. *J. Russ. Phys. Chem. Soc.* **47**, 1211–23(1915).—In view of the near relation of pyrrole (*a*) with chlorophyll and hemin, its condensation product with BzPh (*b*) was examd. The reaction takes place only by warming (*a*) with (*b*) in alc. in presence of a small amt. of HCl as catalyzer. The product yielded *α-dipyrryldiphenylmethane*, $(C_4H_4N)_2CPh_2$ (*c*), small crystals, m. 264° (yield 30%), and *α-pyrryldiphenylcarbinol*, $(C_4H_4N)Ph_2COH$ (*d*), dark red, amorphous powder, decomps. 170°, colored yellow by alkalies but the red color is restored by acid. That these compds. are α-derivs. is shown by the fact that they can also be made by the action of (*b*) on pyrryl-MgBr which usually gives α-compds. (*C. A.* **9**, 87). It is supposed that the formation of (*d*) precedes that of (*c*), the latter being the result of the interaction of the former with (*a*). On keeping (*d*) changes color and gradually condenses, its mol. wt. becoming higher. Still less stable is the greenish black *dye* obtained by the action of HCl on (*d*) in Et_2O. It colors fabrics raspberry-red, and the color is quite fast. It is supposed that the formation of the dye is accompanied by an isomerization of the (*a*) ring from secondary to tertiary base, the H of the NH being eliminated with the OH of (*d*) as H_2O, and that the formula of the dye is, therefore, $\underline{N:CH.CH:CH.CPh_2}$ in which the N is the auxochrome. H. M. Gordin.

Nature and structure of tripyrrole. V. V. Chelintzev, B. V. Tronov and B. I. Voskresenskii. *J. Russ. Phys. Chem. Soc.* **47**, 1224–44(1915).—Tripyrrole (*a*) was made by Dennstedt's method (*Ber.* **27**, 476), but the compd., m. sharply 121°, into which, according to D., it changes could not be obtained. As soon as it is exposed to the air (*a*) begins to oxidize and to condense, its m. p. gradually changing from 86–90° to 70–124° and its mol. wt. gradually increasing. Treated with an alkyl-Mg halide (*b*), 1 mol. of (*a*) consumes only 1 mol. of (*b*), and the amt. of gas obtained by decompg. the resulting product also indicated that 1 mol of (*a*) interacts with only 1 of (*b*). Since pyrrole itself reacts normally with (*b*), (*a*) cannot contain more than 1 mobile H atom, *i. e.*, more than 1 NH. Hence D.'s formula for (*a*) with 3 NH is not in accord with facts. A better formula is either of the following:

$$\underline{N.CH:CH.CH_2.CH}.\underline{CH.CH.NH.CH.CH}.\underline{CH.CH_2.CH:CH.N}, \text{ or}$$

$$\underline{CH.CH:CH.NH.CH.N.CH:CH.CH_2.CH.CH.CH_2.CH:CH.N}$$

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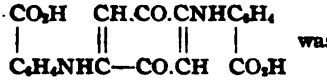
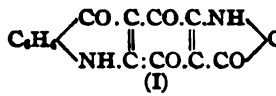
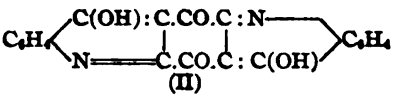
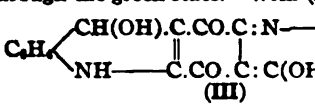
Various attempts to get definite compds. by acting on (*a*) with other substances were not successful. With acetone in presence of HCl it gave an unstable cryst. *substance*, m. 150° and having a mol. wt. of 559. Acting with Ac_2O on the Mg deriv. of (*a*) a bright yellow *substance* was obtained which after decompn. reacted with HCl and with $PtCl_4$ to give a brown and a red *compound*, resp. When made to condense under the influence of HCl, *N*-methylpyrrole gave instead of a deriv. of (*a*) *di-N-methylpyrrole hydrochloride*, $2C_4H_4NCH_3HCl$, decomps. 190°, turns yellow on keeping, and is converted by NH_3 into a feebly basic, unstable yellow *oil*. Why this salt contains only 1 HCl is not clear. When triindole (*c*) (Keller, *C. A.* 7, 1716) is treated with (*b*) the product upon decompn. yields an amt. of gas corresponding to 1 mol. of (*b*) for 1 of (*c*). Hence the formula of the latter is probably similar to that of (*a*). H. M. G.

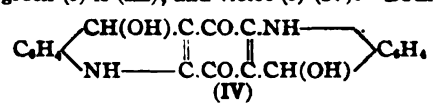
Quinonediacridone. V. V. SHARVIN. *J. Russ. Phys. Chem. Soc.* 47, 1260–8 (1915).—Quinonedianthranilic acid,  was condensed by heating with concd. H_2SO_4 to *quinonediacridone* (*a*), either (I) or (II); it could be purified


(I)


(II)

only by sublimation, small orange crystals, insol. in all solvents tried, with exception of boiling paraffin, giving a purple-red soln., concd. H_2SO_4, giving a yellow soln. from which H_2O reppts. it unchanged, and com. $POCl_3$ containing some HCl; slightly sol. with yellow color in concd. HCl. By allowing the soln. of (*a*) in H_2SO_4 slowly to absorb H_2O a cryst. *sulfate*, $C_{20}H_{10}N_2O_4.H_2SO_4$, was obtained. The salt has a yellow color and a metallic luster, and when perfectly dry can be kept unchanged, but exposure to damp air changes it to (*a*). The latter is very stable towards oxidizing agents and does not react with PCl_5, NH_2OH, $PhNHNH_2$, $NaHSO_3$ or glycerol. *Dibromide*, $C_{20}H_8Br_2N_2O_4$, by heating (*a*) with Br and some H_2O to 180°, red powder. *Dinitro compound*, red powder. *Sulfo compound* (*b*), by heating (*a*) with fuming H_2SO_4 (50% SO_3); its *sodium salt* (*c*) is difficultly sol. in H_2O. When (*a*) is covered with concd. alkali it turns red but does not dissolve even upon heating, the liquid remaining colorless. When, however, the alkali is poured off and the residue washed with H_2O the washings are yellowish, and the residue gradually assumes the original color. This behavior shows that (*a*) also has acidic properties, forming red salts that are insol. in concd. alkali but are hydrolyzed by H_2O to give yellow hydrosols. Since the formation of salts and the orange color of (*a*) are in better accord with (II) than with (I), the former is to be preferred. When (*a*) is reduced by means of hydrosulfite (*d*) it changes first to a green and then to a violet *tetrahydroquinonediacridone*, $C_{20}H_{14}N_2O_4$ (*e*), rectangular plates, a little more sol. in org. solvents than (*a*), is not sublimable in cryst. form even in a current of H, dissolves in concd. H_2SO_4 with blue color, but on standing the soln. turns at first green and then yellow, and diln. with H_2O reppts. unchanged (*a*). Protected from the air violet (*e*) is stable, otherwise it gradually reverts to (*a*), again passing through the green state. With (II) for (*a*), green (*e*) is (III), and violet (*e*) (IV). Both


(III)


(IV)

(*a*) and its derivs. are dyes, wool and silk being colored yellow by dissolving (*a*) in concd. H_2SO_4, dilg. with H_2O and immersing the materials in the turbid liquid, while for dyeing cotton it is soaked in a paste of (*a*), gum and H_2O, and, after drying, immersed in an alk. soln. of (*d*) until it turns green, when it is exposed to the oxidizing action of the

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air. If the cotton be kept in the (*d*) soln. until it turns violet the oxidation by the air is considerably retarded. By (*b*) in a feebly acid soln. silk is dyed a golden yellow, while a soln. of (*c*) + (*d*) dyes it blue. Owing to the indifference of (*a*) to oxidizing agents, the coloration by it is very stable towards light, whose action, as a rule, is one of oxidation. In an atm. of H, however, light changes the coloration to a grayish blue, but the original color is restored upon oxidation. The yellow color of silk dyed with (*b*) changes on exposure to light even in the air, at first turning blue by oxidation, and then greenish gray by reduction. The reduction in this case is probably due to the reducing effect of the fiber itself, giving a different reduction product. Oxidation with CrO_3 soln. restores the yellow color. H. M. Gordin.

Nitration of α-aminopyridine. II. A. E. Chichibabin and B. A. Razorenov. *J. Russ. Phys. Chem. Soc.* 47, 1286–96(1915).—In a former article (*C. A.* 9, 1902) it was stated that the nitration of α-aminopyridine (*a*) yields α,β-aminonitropyridine (*b*) and α,β′-aminonitropyridine (*c*), together with a substance which was taken for a sulfate. Further investigation showed that what was regarded as a sulfate is *α-pyridylnitramine*, $C_5H_4NNHNO_2$ (*d*), which is the chief product of nitration of (*a*), (*b*) and (*c*) owing their formation to an isomerization of (*d*) under the influence of warm, concd. H_2SO_4. (*d*) forms needles, decomp. 184°, is but little sol. in concd. mineral acids, showing it completely to lack basic properties, but is readily sol. in dil. alkalies and drives out CO_2 from carbonates, showing it to possess acid properties. The addition of concd. alkali to dil. alk. solns. of (*d*) ppts. *alkali salts* in shining plates. The *potassium salt* may be obtained in needles or irridescent plates by recrystn. from alc. Owing to the fact that not all batches of (*d*) had exactly the same appearance and behavior, it is supposed that it also exists in the isomeric form $C_5H_4NN(NO)OH$. Nitration of (*c*) gives β′-nitro-α-pyridylnitramine (*e*), previously described, flat needles, behaves like (*d*) with acids and alkalies, and exists also in an isomeric form with 1 of the NO_2 in the β- instead of in the β′-position. Both isomers of (*e*) are isomerized by hot, concd. H_2SO_4 to the same *α-amino-β,β′-dinitropyridine*, m. 191–2°, is colored brown but not dissolved by dil. alkali. The reduction of (*d*) gave *α-pyridylhydrazine*, needles, m. 46–8°, readily oxidizes in the air, turning red and then resinifying, reacts with BzH to form a *hydrazone*, $C_{12}H_{11}N_3$, m. 150–1°. H. M. Gordin.

Condensation of di-α-naphthylmethane derivatives with phenol and aniline. O. Yu. Magidson. *J. Russ. Phys. Chem. Soc.* 47, 1302–10(1915).—Contrary to the statement of Schmidlin and Massini (*C. A.* 3, 2557, 2558), the reaction product (*a*) of $(\alpha\text{-}C_{10}H_7)_2CHOH$ (*b*) with PhOH is not the ether $(C_{10}H_7)_2CHOPh$ but *p-hydroxyphenyldi-α-naphthylmethane*, $(C_{10}H_7)_2CHC_6H_4OH$ (*c*). This is proved by the fact that (*a*) does not react with HBr, does not give with concd. H_2SO_4 the blue-green color characteristic of (*b*) and its ethers, and forms a *potassium salt*, $C_{27}H_{19}OK$, silky leaflets, darkens 235°, m. 245–55° (carbonization), insol. in H_2O, partly decompd. by recrystn. from alc. *p-Anisyldi-α-naphthylmethane*, from the K salt and Me_2SO_4, powder, m. 187–90°. (*c*) may also be prepd. by the interaction of PhOH with $(C_{10}H_7)_2CHBr$ (*d*). The reaction product of (*b*) with $PhNH_2$ is, contrary to S. and M.'s statement, *p-aminophenyldi-α-naphthylmethane* (*e*), m. 225–6°. The latter may also be made by taking in this reaction (*d*) instead of (*b*). *Sulfate*, $C_{27}H_{21}N.H_2SO_4$, hygroscopic needles, m. 325° (decompn.), turns reddish on exposure to light, insol. in H_2O, difficultly sol. in alc., is partly decompd. by glacial AcOH. *Hydrochloride*, $C_{27}H_{21}N.HCl$, hygroscopic needles, m. 210–4°, affected by insolation, insol. in H_2O, a little more sol. in alc. than the sulfate. (*e*) gives a diazo compd. which copulates with $\beta\text{-}C_{10}H_7OH$ to form a minium-like dye, and changes to (*c*) upon boiling with dil. acids. H. M. Gordin.

Catalysis in the synthesis of pyridine homologs by Ladenburg's method. A. E. Chichibabin and P. F. Ryumshin. *J. Russ. Phys. Chem. Soc.* 47, 1297–302(1915).

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—With a view to finding a more convenient method of making pyridine (*a*) homologs than heating the ingredients in sealed tubes (Ladenburg, *Ann.* **247**, 1), the influence of catalyzers on the reaction of (*a*) with $PhCH_2Cl$ and with EtI under ordinary pressure was examd. TiO_2, Fe_2O_3, LiCl and NH_4Cl were found to be ineffective, while CuCl or powdered Al, Mg or Cu gave as good results as L.'s method. A detailed study of the reaction is under way. H. M. GORDIN.

A new method of preparation of triazoles. KARL BRUNNER. Univ. Innsbruck. *Monatsh.* **36**, 509–34(1915); cf. *C. A.* **9**, 211.—Dimethyltriazole (*A*) is best prepd. by warming a mixt. of 5 g. Ac_2NH, 11 g. $H_2NCONHNH_2.HCl$ and 13.5 g. AcONa in 100 cc. H_2O for 15 hrs. at 100°, dilg. with H_2O, filtering, shaking with BzH and filtering, concg. to dryness, extg. with EtOH, taking the ext. up in H_2O, making alk. and extg. the dry residue with Et_2O. This is identical with the dimethylpyrro-(*bb*)-diazole of Stollé (*J. prakt. Chem.* [2] **69**, 153(1904)) and the *C*-dimethyltriazole of Pellizarri (*C. A.* **5**, 3806). Hydrochloride, m. 199–200°. Nitrate, m. 126–7°, decomps. 130°. *Mercury-mercuric chloride complex*, $(C_4H_6N_3)_2Hg.2HgCl_2$, sandy powder, m. 242–3°. *Mercuric chloride salt*, $C_4H_7N_3.4HgCl_2$, obtained by using an excess of $HgCl_2$, prisms, m. 185°. The same salt is obtained from the nitrate and $HgCl_2$ (cf. Hantzsch and Silberrad, *Ber.* **33**, 68(1900)). The above reaction is explained by the intermediate formation of dimethyltriazolecarboxamide, $N{:}CMe.N{:}CMe.NCONH_2$, which then reacts with a 2nd mol. of $H_2NCONHNH_2$ and forms the triazole. The supposition that Ac_2NH reacts as a β-diketone is supported by its behavior towards $PhNHNH_2$. Free $PhNHNH_2$ and Ac_2NH give PhNHNHAc, m. 128–9°. The HCl salt and AcONa give a good yield of 3,5-dimethyl-1-phenyl-1,2,4-triazole, m. 45–6°. Free $(H_2N)_2$ and Ac_2NH do not give (*A*); the HCl salt gives a small amt. but mostly Ac derivs. of $(H_2N)_2$. Free $H_2NCONHNH_2$ does not give (*A*) but Ac derivs. and $AcNH_2$.

C. J. WEST.

Photochemical reductions. X. Reduction of glycol aldehyde to ethylene glycol. CARL NEUBERG AND ERWIN SCHWENK. Kaiser Wilhelm Inst. *Biochem. Z.* **71**, 114–7(1915); cf. *C. A.* **9**, 58.—Glycol aldehyde, added to an actively growing yeast prepn., gives about 30% of $HOCH_2CH_2OH$. **XI. Change of ethyl disulfide into ethyl mercaptan.** *Ibid* 118–21.—About 4% of $(EtS)_2$ is changed into EtSH by growing yeast. It was isolated as the Hg compd. **XII. Transformation of citronellal into citronellol.** PAUL MAYER AND CARL NEUBERG. *Ibid* 174–9.—Actively fermenting yeast changes citronellal, into citronellol, the yield being about 59% under favorable conditions. C. J. WEST.

Behavior of α-keto acids towards microörganisms. III. The decomposition of *dl*-methylethylpyruvic acid. CARL NEUBERG AND BRUNO REWALD. Kaiser Wilhelm Inst. *Biochem. Z.* **71**, 122–5(1915); cf. *C. A.* **9**, 472.—Putrifying bacteria, acting upon $MeEtCHCOCO_2H$, give $MeEtCHCO_2H$ with $[\alpha]^{17}$ 5.30° (thus about 30% of the active form) and a small amt. of $MeEtCHCH_2CO_2H$, with a rotation of 1.85° (pure *d*-acid, 8.98°). HCO_2H is also formed. C. J. WEST.

Methylglyoxal formation. II. CARL NEUBERG AND BRUNO REWALD. Kaiser Wilhelm Inst. *Biochem. Z.* **71**, 144–9(1915); cf. *C. A.* **8**, 1129.—6 g. of the following sugars warmed with 300 cc. of 10% NH_4OH in pressure flasks at 100° for 8 hrs. gave the indicated amts. of crude methylglyoxal osazone: *l*-arabinose, 8 g.; *l*-xylose, 1.96 g (pure); rhamnose, 4 g.; *d*-glucose, 8.5 g. (2.6 g. pure); *d*-fructose, 6.5 g. (2.5 g. pure); *d*-galactose, 1 g.; *d*-glucosamine, 3.6 g. (0.5 g. pure). C. J. WEST.

Simple rearrangements in the series of glycols and their nitrogen-containing derivatives. II. Formation of propionic aldehyde and acetone from propylene glycol,

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propylenediamine, trimethylene glycol and trimethylenediamine. CARL NEUBERG AND BRUNO REWALD. Kaiser Wilhelm Inst. *Biochem. Z.* **71**, 158–66(1915); cf. *C. A.* **9**, 58.—$MeCH(OH)CH_2OH$, oxidized with 3% H_2O_2 and a little $FeSO_4$, gives a mixt. of acetone and EtCHO. In the same way $CH_2(CH_2OH)_2$ gives EtCHO. $MeCH(NH_2)CH_2NH_2$ and $CH_2(CH_2NH_2)_2$, when treated with HNO_2, give a mixt. of acetone and EtCHO. Because of the difficulty of isolating the EtCHO the relative amt. of the 2 products could not be detd. C. J. WEST.

Oxidation of amines. K. SUTO. Kaiser Wilhelm Inst. *Biochem. Z.* **71**, 169–73 (1915).—Amines, in the form of their sulfates, are oxidized to aldehydes by the action of H_2O_2 and $FeSO_4$. $EtNH_2$, $C_5H_{11}NH_2$, $H_2NCH_2CH_2OH$ and $PhCH_2NH_2$ were studied. C. J. WEST.

Transformation of aliphatic and aromatic sulfonic acids into aldehydes or phenols. JOHN A. MANDEL AND CARL NEUBERG. Kaiser Wilhelm Inst. *Biochem. Z.* **71**, 180–5(1915).—Sulfonic acids are oxidized by H_2O_2 and $FeSO_4$ to aldehydes and H_2SO_4. Ethane-, aminoethane-, benzyl- and benzenesulfonic acids were studied. In the case of the NH_2 derivs., NH_3 is also split off. With the aromatic derivs. small amts. of phenols are formed, while with $PhSO_3H$, PhOH and $C_6H_4(OH)_2$ are formed. C. J. WEST.

Cholesterol sulfuric acid. JOHN A. MANDEL AND CARL NEUBERG. Kaiser Wilhelm Inst. *Biochem. Z.* **71**, 186–95(1915).—Two g. $ClSO_3H$ were dropped into a cooled mixt. of 30 cc. $CHCl_3$ and 12 cc. C_5H_5N and 6.5 g. cholesterol in 20 cc. $CHCl_3$ added. After 15 min. the mixt. is warmed for 15 min. at 50°, concd. *in vacuo* at 40°, 50 cc. of 2 *N* KOH added and the mixt. concd. to dryness. The dry residue is extd. with Et_2O and H_2O and recrystd. from 500 cc. of 80% alc. *Potassium cholesterol sulfate* forms fine needles, m. 235° (decompn.); yield, 89%. The H_2SO_4 is easily hydrolyzed off. Boiled with AcOH it forms acetylcholesterol. Heated with HCl (d. 1.12) 12 hrs. at 100° in a sealed tube it gives cholesterol. It is stable, for only a trace of H_2SO_4, is split off by shaking the salt with the calcd. amt. of HCl for 36 hrs. *Sodium salt*, glistening needles, m. 163–4° (decompn.). It is more sol. than the K salt. The salts do not react with digitonin. In 80% alc., $[\alpha]_D^{25}$ —3°. *Ammonium salt*, needles, m. 185° (decompn.). The Na salt gives insol. ppts. with $BaCl_2$, $CaCl_2$, $MgSO_4$, $CuSO_4$, $Pb(OAc)_2$, $FeCl_3$, and $ZnSO_4$. The Salkowski reaction is negative; upon warming it is positive because of hydrolysis. The Liebermann reaction is positive, Ac_2O giving a violet color changing to blue and then green. C. J. WEST.

Manner of formation of natural succinic acid. I. The succinic acid fermentation of α-ketoglutaric acid. C. NEUBERG AND M. RINGER. Kaiser Wilhelm Inst. *Biochem. Z.* **71**, 226–36(1915).—α-Ketoglutaric acid, digested with fresh yeast or with maceration juice, gives succinic acid, in the latter case in a yield of 99%. **II. Production of succinic acid by the decomposition of α-ketoglutaric acid.** *Ibid* 237–44.—Putrifying bacteria decomp. α-ketoglutaric acid, giving 13 to 20% of succinic acid, besides volatile fatty acids. C. J. WEST.

Formation and stability of spiro-compounds. I. Spiro-compounds from cyclohexane. RICHARD M. BEESLEY, CHRISTOPHER K. INGOLD AND JOCELYN F. THORPE. *J. Chem. Soc.* **107**, 1080–1106(1915).—A series of investigations has been undertaken with the object of ascertaining "the effect produced by the alteration of the tetrahedral angle consequent on ring formation, on the formation and stability of a 2nd ring joined to the existing ring by a quaternary C atom common to both." The hypothesis was advanced that the angle formed by the 2 side chains attached to any 1 C atom of the cyclohexane ring will be altered in proportion to any change in angle between those valencies which participate in ring formation; *i. e.*, the groups attached to 2 side chains

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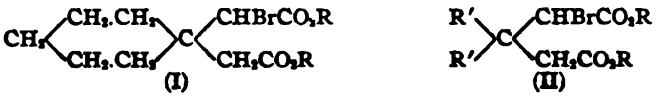
emanating from the same C atom of a cyclohexane deriv., type (I), will be closer together than in a corresponding compd. having the open chain structure, type (II).



(I) (II)

Expts. show that this hypothesis is probably correct. For example a *trans*-spiro-acid, $C_5H_{10}>C<\begin{matrix}CHCO_2H\\|\\CHCO_2H\end{matrix}$, derived from a compd. of type (I) is more stable than *trans*-caronic acid, $Me_2C<\begin{matrix}CH.CO_2H\\|\\CH.CO_2H\end{matrix}$, derived from a compd. of type (II). The above hypothesis and another untenable one are presented and discussed in some detail and diagrammatically represented by showing the effect of "strain" on the angles between the valencies (represented by the apices of an inscribed tetrahedron) of a (spherical) C atom. The bromination of $CH_2(CH_2)_4C(CH_2CO_2H)_2$ by means of PBr_5 and Br led to the formation of a mixt. containing an acid product, probably $C_5H_{10}>C(CHBr\text{-}CO_2H)(CH_2CO_2Et)$ (*A*), and a neutral product (*B*). The latter was shown to be a mixt. of *cis-diethyl α,α'-dibromocyclohexane-1,1-diacetate* (*C*) (not obtained in the pure state) and the *trans-lactone* (*D*), $C_5H_{10}>C.CH(CO_2Et).O.CO.CHBr$, prisms from petroleum or alc., m. 96°, b_{20} 225–30°. (*D*) was sepd. from the mixt. (*B*) by the addition of an equal vol. of petroleum (b. 60–70°) and was also synthesized by boiling (*C*) with C_5H_5N [whereby only the *trans*-form of (*C*) was converted into (*D*)] or by distg. (*C*), whereby both the *cis*- and *trans*-forms were converted. The isomeric *cis-lactone* (*D'*), microneedles, m. 69–70°, was formed in 25% yield upon distg. (*C*) from which (*D*) had been previously removed by means of C_5H_5N. *α-Hydroxycyclohexane-1,1-diacetic acid lactone* (*E*), $C_5H_{10}>C.CH(CO_2H).O.CO.CH_2$, b_{18} 240–1°, crystg. after long standing and seeding, microneedles, m. 91–2° (*silver salt*, amorphous), was formed from (*A*) by the action of boiling Na_2CO_3. The free acid (*F*) corresponding to (*E*) could not be isolated and was found to be stable only in the form of its salts. The amorphous *silver salt* and cryst. *sodium salt* of (*F*) were prepd. The *dianilide* of (*F*), $C_5H_{10}>C(CH_2CONHPh)CH(OH)CONHPh$, needles, m. 97°. The *aniline salt* of (*E*), silky needles, m. 104°. When (*A*) was added to boiling concd. KOH and the reaction mixt. cooled and acidified, *trans-cyclohexane-spiro-cyclopropane-1,2-dicarboxylic acid* (*G*), $C_5H_{10}>C.CH(CO_2H).CHCO_2H$, flattened needles, m. 237°, was formed. Its *silver salt* sepd. in the form of a cryst. powder: its *dianilide*, needles, m. 292°. The filtrate from (*G*) after extn. with Et_2O and fractionation under reduced pressure yielded the *cis-isomer* (*H*) of (*G*), needles, m. 198°, more readily formed by distg. (*G*) which is first converted into the anhydride (*J*), $C_5H_{10}>C.CH.CO.O.CO.CH$, needles, m. 102°, which on treatment with alkali and subsequent acidification yields (*H*). (*J*) was also readily prepd. by the interaction of (*H*) and AcCl, whereas (*G*) is not acted upon by this reagent. The *anilic acid*, $C_5H_{10}>C.CH(CO_2H).CHCONHPh$, derived from (*J*), small needles, m. 207° (decompn.); the corresponding *anil*, m. 119°. When heated in a sealed tube with 50% concd. HCl at 180° for 5 hrs., (*H*) is partially reconverted into (*G*). On attempting to replace the Br in (*D*) by an OH group, by means of moist Ag_2O, *ethyl α-hydroxycyclohexane-1,1-diacetate lactone*, $C_5H_{10}>$

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$C.CH_2CO.O.CHCO_2Et$, b_{21} 210°, was obtained and yielded (*E*) on hydrolysis. The following hydrolysis products were formed when (*D*) was treated with boiling 15% aq. NaOH: $C_5H_{10}>C:CHCO_2H$ (*K*), m. 92° (identical with Wallach's acid as shown by the formation of the dibromide, m. 135–6°; ref. not given), and the *trans-lactonic acid of α,α'-dihydroxycyclohexane-1,1-diacetic acid* (*L*), $C_5H_{10}>C.CH(OH).CO.O.CHCO_2H$.-$H_2O$, prisms, 100°, anhydrous, m. 145°. (*D'*) when subjected to a similar hydrolysis gave rise to a mixt. of (*K*), the *cis-isomer* (*M*) of (*L*), prisms, m. 168°, and *cyclohexane-spiro-cyclopropanol-2,3-dicarboxylic acid* (*N*), $C_5H_{10}>C.C(OH)(CO_2H).CHCO_2H$, pearly plates, m. 217°. Boiling alc. KOH, reacting with (*D*), yielded (*K*), (*L*) and (*N*). The action of 64% aq. KOH on (*D*) gave rise to a mixt. of (*L*), (*N*) and Δ^1-cyclohexene-acetic acid, (*O*), $CH_2(CH_2)_2CH:C.CH_2CO_2H$, m. 38° (identical with Wallach's compd.; also quant. formed by boiling (*K*) with 64% KOH, thus indicating that it was a by-product in the above reaction). The Et ester of (*O*), b_{25} 118–2° (cf. Auwers and Ellinger, *C. A.* **6**, 1147). A similar reaction between 64% KOH and (*D'*) gave rise to (*O*), (*M*) and (*N*). (*K*) and (*N*) were sepd. by treatment with dry Et_2O in which (*N*) is insol. (*L*) was ordinarily sepd. from hydrolysis mixts. by esterifying and fractionating the *ethyl ester*, b_{25} 206–10°. The following derivs. of (*L*) are described: *disodium salt*, cryst.; *disilver salt*, powder; *aniline salt*, microcrystals, m. 133–4°; *dianilide*, $C_5H_{10}>C[CH(OH)CONHPh]_2$, short needles, m. 169°. (*L*) does not react with AcCl, is not reduced by AgOH, and when heated with H_2O in a sealed tube or when distd., passes into (*M*). The isolation of (*M*) was effected by esterifying hydrolysis mixts. and collecting the fraction of highest b. p., which was subsequently hydrolyzed with HCl. (*M*) was readily acetylated. The following derivs. of (*M*) were prepd.: *disilver salt; dianilide*, needles, m. 169° (*not* identical with the dianilide derived from (*L*)); *acetate*, $C_5H_{10}>CH(OAc).CO.O.CHCO_2H$, m. 156° (*silver salt* of the acetate, cryst. powder). The spiro-acid (*N*), which like (*L*) could not be acetylated, which is not converted into the lactone on heating and is otherwise stable, gave rise to the following compds.: *silver salt*, cryst. powder; *anilide*, needles, m. 202°. Concd. H_2SO_4 acting upon (*L*) at 95–100°, gave rise to small amts. of *cyclohexane-spiro-cyclopentanone*, oil (forming a *semicarbazone*, needles, m. 175°), and an unidentified compd., m. 105°. When heated with an equal amt. of H_2O in a sealed tube at 240° for 0.5 hr., (*L*) yielded the *lactonic acid of α-hydroxy-α'-cyclohexan-1-olsuccinic acid*, $C_5H_{10}>C.O.CO.CH(OH).C-HCO_2H$, cubical prisms, m. 131°, whose *disodium salt*, *disilver salt* and *aniline salt*, m. 123°, were prepd.

LOUIS E. WISE.

The state of carbonic acid in the blood. II. Mobility of the HCO_3' ion at 18°. E. D'AGOSTINO AND G. QUAGLIARIELLO. *Atti accad. Lincei* **24**, I, 638–45(1915).—These expts. were necessary in order to prep. the way for a study of the dissociation of bicarbonates and carbonic acid. The only data in the literature for 18° are those of Walker and Cormack (*J. Chem. Soc.* **77**, 5(1900)) who measured the sp. electrical cond. of very dil. solns. of $NaHCO_3$ either in pure H_2O or in H_2O containing a little H_2CO_3. The 2 series gave nearly identical results by which it was thought that it was shown that hydrolysis of bicarbonates does not noticeably affect the values. The limit mol. cond. is thus $\mu_\infty = 84.4$. The limit mol. cond. of the Na' ion is 43.6 at 18° and thus the mobility of the HCO_3' ion at 18° is 84.4 — 43.6 = 40.8. A. and Q. detd. this value again and also at 37° with the idea of applying the values to liquids in the organism. *Solns. of $NaHCO_3$ in pure H_2O at 18°.* The amt. of hydrolysis was rigor-

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ously controlled thus: the amt. of soda m in mols. per l. that is free for hydrolysis in a dil. soln. of $NaHCO_3$ of concn. n is given by the formula $m = n\sqrt{1/n - k_w/k} = \sqrt{n\sqrt{k_w/k}}$ in which k_w is the dissociation const. of H_2O (0.6210^{-14}) and k is the dissociation const. of H_2CO_3 (provisional value 0.03610^{-6}) so that $m = 0.03110^{-3}\sqrt{n}$. The $NaHCO_3$ soln. may be considered as a mixt. of a soda and bicarbonate soln. If the cond. of bicarbonate that is obtained after subtracting the cond. of H_2O be x, that of an n mol. soln. of soda be x_1 and that of a n mol. $NaHCO_3$ be x_2, then $x_2 = (xn - x_1m)/(n - m)$. In this way the observed values were corrected. The limit. cond. of $NaHCO_3$ is $\mu_\infty = 84.4$ at 18° and the mobility of HCO_3' is $84.4 - 43.6 = 40.8$. *Solns. of $NaHCO_3$ and $KHCO_3$ or of NaOH and KOH in H_2O more or less rich in H_2CO_3 at 18°.* It was observed that the cond. of a soln. of a bicarbonate tends to increase with time which makes it seem probable that the inevitable liberation of CO_2 from the part of the solns. exposed to the air may increase the free soda and influence the limit cond. more than hydrolysis. In such a case the value for the mobility of HCO_3' obtained above would be too high. This was confirmed in a series of expts. on solns. of $NaHCO_3$ and $KHCO_3$ in CO_2-H_2O and then on H_2CO_3 solns. containing insufficient but known amts. of KOH and NaOH. A special method of calcg. the correction of the exptl. results is described. The cond. of a 0.00835 mol. soln. of H_2CO_3 after adding variable amts. of $NaHCO_3$ is $\mu_\infty = 85.0$ (mobility of HCO_3' $85.0 - 43.6 = 41.4$); cond. of a 0.0107 mol. soln. of H_2CO_3 after adding variable amts. of $KHCO_3$ is $\mu_\infty = 104.1$ (mobility of HCO_3' $104.1 - 64.7 = 39.4$); cond. of a 0.0298 mol. soln. of H_2CO_3 after adding a variable amt. of $NaHCO_3$ is $\mu_\infty = 81.6$ (mobility of HCO_3' $81.6 - 43.6 = 38.0$); cond. of a 0.0405 mol. soln. of H_2CO_3 after adding variable amts. of NaOH is $\mu_\infty = 82.9$ (mobility of HCO_3' $82.9 - 43.6 = 39.3$); cond. of a 0.0405 mol. soln. of H_2CO_3 after adding variable amts. of KOH is $\mu_\infty = 104.0$ (mobility of HCO_3' $104.0 - 64.7 = 39.3$). The corrections mentioned above are of importance only for solns. rich in CO_2 and poor in bicarbonate. The values 43.6 and 64.7 are the mobilities, resp., of Na' and K' from the data of Kohlrausch. The mean value for the mobility of HCO_3' at 18° is 39.3 which is less than that of W. and C. (41.4) without corrections for hydrolysis and the value (40.8) first obtained on H_2O solns. of $NaHCO_3$ corrected for hydrolysis. The latter series show that this divergence is due to loss of CO_2 and the simultaneous acquisition of a larger cond. **III. Mobility of HCO_3' ion at 37°.** G. QUAGLIARIELLO AND E. D'AGOSTINO. *Ibid* 24, I, 772–3.—The expts. described in the preceding abstr. were repeated at 37°. The latter method, in which known amts. of NaOH were added to H_2CO_3 solns. in H_2O, was used because the errors in this method are smaller. The theoretical considerations in the calcn. of corrections were the same in this case. The formula $x = 0.0314 \times 10^{-3}\sqrt{m}$ serves to calc. the cond. of a known soln. of H_2CO_3 at 37°. The formula of correction of the sp. cond. of solns. of H_2CO_3 + NaOH is $x_2 = x - 0.0188 \times 10^{-6}\, m/n$ in which m is the concn. of free H_2CO_3, n the concn. of soda and thus the concn. of $NaHCO_3$ formed, x the sp. cond. as measured and x_2 the corrected sp. cond. The mol. cond. of $NaHCO_3$ in a 0.02215 mol. soln. of H_2CO_3 after adding varying quantities of NaOH is $\mu_\infty = 122.0$. The mobility of Na' at 37° is 63.8 according to Kohlrausch and thus $122.0 - 63.8 = 58.2$ the mobility of HCO_3' at 37°. **IV. The electrolytic dissociation of sodium bicarbonate.** E. D'AGOSTINO AND G. QUAGLIARIELLO. *Ibid* 24, I, 858–62.—In the preceding papers the mobility of the HCO_3' ion was detd. at 18° and at 37°, by measuring the cond. of dil. solns. of alkali bicarbonates. The authors have now studied the dissociation of $NaHCO_3$ by detg. the cond. of more concd. solns. The mol. concn., the mol. cond. and the degree of dissociation, resp., at 18° are: 0, 82.9 = μ_∞, 1.0000; 0.009387, 77.54, 0.9354; 0.02347, 73.93, 0.8918; 0.04694, 70.81, 0.8542; 0.09387, 68.00, 0.8203; 0.1877, 63.27, 0.7632. At 37° the corresponding values are 0, 122.0 = μ_∞, 1.0000; 0.009387,

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116.4, 0.9541; 0.02347, 110.5, 0.9057; 0.04694, 106.2, 0.8705; 0.09387 100.7, 0.8254; 0.1877, 93.56, 0.7669. On the basis of these data tables for the degree of dissociation for 0.005, 0.010, etc., mols. per l. up to 0.200 mols. were calcd. It is next necessary to det. the degree of dissociation of $NaHCO_3$ in the blood for use in later papers, and in order to obtain this the variations in this value caused by NaCl must be considered, since NaCl + $NaHCO_3$ constitute all but 1.8% gram equiv. of salts in the blood. Calcns. were made of the mol. concns. of NaCl and $NaHCO_3$ isohydric, resp., at various degrees of dissociation both for 18° and 37°. It was thus found that NaCl is less dissociated at 37° than at 18°, which fact can also be deducted from the results of Noyes and Coolidge (*Z. physik. Chem.* **46**, 375(1903)) by which it was shown that increase in temp. depresses the dissociation of NaCl. In order to calc. the degree of dissociation α of a soln. that contains n mols. $NaHCO_3$ and N mols. NaCl per l. it is necessary to plot a curve of the values for the mol. concn. n_i and N_i for $NaHCO_3$ and NaCl for the various values of α by plotting n_i on the abscissa and N_i on the ordinate. Then if v_i is the vol. in l. occupied by an isohydric soln. of $NaHCO_3$ the values of n/v_i and $N/(1-v_i)$ were calcd. by using arbitrary values for v_i, and a curve was constructed over the above by plotting the values n/v_i on the abscissa and $n/(1-v_i)$ on the ordinate. The point at which the 2 curves cross gives the isohydric concn. desired. Now blood plasma contains, for example, 0.14 mols. NaCl and 0.015 mol. $NaHCO_3$ per l. at 37°. With v_i = 0.13 one has n/v_i = 0.1153 and $n/(1-v_i)$ = 0.161, with v_i = 0.12 n/v_i = 0.125 and $N/(1-v_i)$ = 0.159; with v_i = 0.11, n/v_i = 0.1363 and $N/(1-v_i)$ = 0.1573. The curve thus obtained crosses the other curve at the ordinate 0.159 and the abscissa 0.122. Now the degree of dissociation of a 0.122 mol. $NaHCO_3$ soln. is 0.808. Thus the blood plasma considered contains 0.808 × 0.015 = 0.0121 HCO_3' gram ions, 0.804 × 0.14 = 0.113 Cl′ gram ions, 0.0150 − 0.0121 = 0.0029 mol. $NaHCO_3$ undissociated and 0.140 − 0.113 = 0.027 mol. NaCl undissociated.

E. J. Witzemann.

Some derivatives of β-triphenyllactic acid. R. de Fazi. Univ. Rome. *Atti accad. Lincei* **24**, I, 439–42(1915); *Gazz. chim. ital.* **45**, I, 552–7(1915).—By the action of light on a mixt. of BzPh + $PhCH_2CO_2H$, Paternò and Chieffi (*C. A.* **5**, 2632) obtained $C_{21}H_{16}O_3$ which they considered to be β-triphenyllactic acid (*a*) and, perhaps, $Ph_2C(OH)CHPhCO_2H$. de F. undertook to see if its chem. behavior is in accord with the formula suggested. It was first attempted to dehydrate (*a*) in order to obtain β-triphenylacrylic acid (*b*) for comparison with that obtained according to Heyl and Meyer (*Ber.* **28**, 2787(1895)) by heating Cl_2CPh_2 with BzCN at 220°, which gave β-CPh_2:CPhCOCN and which on sapon. gave first β-CPh_2:CPhCONH$_2$ and then β-CPh_2:CPhCO$_2$H. (*b*) is also obtained by heating Cl_2CPh_2 with $PhCH_2CO_2Me$ at 220° and sapong. the Me ester obtained. α,β-Diphenylindone (*c*), splendid red crystals, m. 150–1°, was obtained as a secondary product. P. obtained (*c*) from (*a*) by the action of P_2O_5 and this confirms the constitution of (*a*) given above. The P_2O_5 first removes one H_2O from (*a*) to give (*b*) and the latter then gives (*c*), but (*b*) could not be obtained in this way. The Et ester of (*b*) was obtained by passing a current of HCl through an EtOH soln. of (*a*). In attempts to obtain the Et ester of (*a*) by the action of EtI on the Ag salt some other substance was obtained which was not identified. Attempts were made to synthesize (*a*) by a reaction like that used by Rupe and Busolt (*C. A.* **2**, 537), *i. e.*, BzPh acting on $PhBrCHCO_2Et$ in the presence of Zn, but a product was obtained upon which further work will be done. 2 g. (*a*) in 800 cc. xylene + 10 g. P_2O_5 were heated 5 hrs. on a H_2O bath, the xylene was distd. off with steam and the residue extd. with Et_2O which gave on evapn. an oil from which were obtained garnet-red prisms of (*c*), m. 151–3°; with concd. H_2SO_4 it gives an emerald-green color in the cold and orange-yellow then ruby-red in hot H_2SO_4; it is identical

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with (*c*) prepd. according to H. and M. 3 g. (*a*) in 300 cc. EtOH satd. with HCl gas was evapd. after 12 hrs. and the residue taken up with dil. $NaHCO_3$ and made alk., giving a dirty gray ppt. of the Et ester of (*a*), m. 119–20°, sol. in boiling H_2O and EtOH from which it is pptd. as white flocks, gives an emerald-green color with cold H_2SO_4 and orange-red then ruby-red in hot H_2SO_4. 5.2 g. of the dry Ag salt of (*a*) in 20 cc. EtOH, treated hot with 15 cc. EtI for 1 hr., filtered and evapd., gave an oil which crystd. in a mixt. of H_2O-EtOH as prisms, m. 116–9°. The constitution of this compd. has not yet been detd. E. J. Witzemann.

Products of dehydration of β-diphenyllactic acid. R. de Fazi. Univ. Rome. *Atti accad. Lincei* **24**, I, 729–34(1915); *Gazz. chim. ital.* **45**, II, 1–6(1915); cf. preceding abstr.—Expts. on β-phenyllactic acid (*a*) have now been made to det. whether P_2O_5 gives β-phenylindone (*b*) with it, but another compd. was obtained instead. (*b*) was, however, obtained by another method which will be described in a later paper. With P_2O_5 (*a*) gave an acid, $C_{30}H_{26}O_5$ (*c*), by condensing 2 mols. of (*a*) with the loss of 1 H_2O. Three formulas are possible: (1) $Ph_2C(OH)CH_2CO_2CPh_2CH_2CO_2H$, (2) $Ph_2C(OH)CH(CO_2H)CPh_2CH_2CO_2H$, (3) $HO_2CCH_2CPh_2OCPh_2CH_2CO_2H$. By analysis of the Ag salt, by NaOH titrations, and by the fact that P_2O_5 acting on the Et ester of (*a*) likewise gives the Et ester of (*c*), formula (1) is excluded. Since Ac_2O does not react the presence of OH is excluded and formula (3) hence is probably correct, *i. e.*, (*c*) is *dehydrodi-β-diphenyllactic acid*. In this reaction also the formation of β-diphenylacrylic acid (*d*) can be foreseen. In order to compare (*c*) with (*d*) some of the latter was prepd. by the action of Ac_2O + NaOAc on (*a*) (Rupe, Busolt, *C. A.* **2**, 537) and it was found that by changing the condition somewhat another compd., $C_{30}H_{22}O_3$, *i. e.*, the anhydride of (*d*), was obtained and was identical with the compd. obtained by treating (*d*) with Ac_2O + NaOAc. (*a*) was prepd. by the method of R. and B. by treating BzPh with $BrCH_2CO_2Et$ in C_6H_6 soln. + granulated Zn and sapon. of the Et ester of (*a*) obtained. 3 g. (*a*) in 300 cc. dry $CHCl_3$ treated with 10 g. P_2O_5 in the cold, warmed 6 hrs., decanted and distd. gave a red oil which crystd. as orange needles, of (*c*), recrystd. from EtOH as cream-yellow needles, m. 155–8°. Titrated with NaOH (*c*) gave values for a dibasic acid. 0.50 g. of the NH_4 salt of (*c*) treated with the calcd. amt. of $AgNO_3$ pptd. the white flocky *silver salt*, $C_{30}H_{24}O_5Ag_2$. 1 g. (*c*) heated with Ac_2O + NaOAc 2 hrs. was unchanged. (*c*) with cold concd. H_2SO_4 gives an emerald-green color and red with hot acid. 5 g. of the Et ester of (*a*) in 200 cc. dry $CHCl_3$ + 10 g. P_2O_5 heated on the H_2O bath 8 hrs. gave the Et ester of (*c*) which on sapon. gave free (*c*). This ester dissolved in 30% KOH in EtOH and boiled 2 hrs., evapd., the residue extd. with Et_2O and acidified with dil. HCl, gave finally (*c*), m. 156–8°. 3 g. (*a*) + 10 g. Ac_2O + 10 g. NaOAc acting for 3 hrs., then treated with H_2O on the H_2O bath and cooled, sepd. a crystallizable oil which sepd. needles of the anhydride of (*d*) from EtOH, m. 120°. The mother liquor gave silky transparent leaves of (*d*), m. 158–60°. E. J. Witzemann.

Transformation of butyric acid into propyl butyrate by the action of light. E. Paternò. *Atti accad. Lincei* **24**, I, 674–5(1915); *Gazz. chim. ital.* **45**, I, 389–90(1915). —In an earlier paper (*C. A.* **5**, 2632) the behavior of acids with BzPh was studied and the synthesis of α-triphenyllactic from phenylacetic and of diphenyladipic acid from phenylpropionic acid was observed. With AcOH it was found that BzPh does not react; with $EtCO_2H$ it gives a yellow resin and with $PrCO_2H$ a considerable amt. of benzopinacol is formed. 80 g. $PrCO_2H$ + 50 g. BzPh were exposed 10 months in the sunlight. Considerable pressure due to CO_2 was developed; benzopinacol was filtered off and the filtrate neutralized with K_2CO_3; it had an odor of fruit and $PrCO_2H$; after extg. with Et_2O the ext. was fractionally distd. and gave $PrCO_2Pr$, b. 135°. The formation of this compd. is easily explained by assuming that the BzPh in being converted into pinacol

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takes the H of CO_2H of $PrCO_2H$ and the compd. $(PrCO_2)_2$ is formed from the residues and by loss of CO_2 gives $PrCO_2Pr$. This type of reaction has not been observed before in photochemistry but it is not new to chemistry. In the electrolysis of fatty acids the ester of the acid with the next lower alc. is observed as a secondary product. Likewise, Simonini (*Monatsh.* 13, 320; 14, 81) found that I acting on $PrCO_2Ag$ gives $PrCO_2Pr$. Thus it is possible by removing the H of AcOH to obtain ethane by the loss of 2 CO_2 but also AcOMe. This reaction seems to explain the formation of ethers in plants. It is proposed to continue these expts. E. J. WITZEMANN.

The action of light on benzophenone and butyric acid. R. DE FAZI. Univ. Rome. *Atti accad. Lincei* 24, I, 942–5(1915); *Gazz. chim. ital.* 45, II, 6–10(1915).—The material obtained in the preceding abstr. was studied in detail. On opening the tube CO_2 was evolved and continued for some min. 19 g. of benzpinacol, m. 184–6°, were filtered off. The filtrate was made alk. with K_2CO_3 and extd. with Et_2O. The Et_2O ext. gave an oil which was studied in the preceding abstr. The soln. after extg. with Et_2O was acidified with HCl; 11 g. of a red tarry substance was pptd. The Ag salt gave 28.11% Ag ($PrCO_2Ag$ = 55.38% Ag) while for a compd. of 1 mol. $PrCO_2Ag$ + 1 mol. BzPh (*i. e.*, $C_{17}H_{17}O_2Ag$) Ag is 28.65%. 5 g. of this oily acid boiled with $BaCO_3$ only dissolved slightly and on acidifying with HCl sepd. a few oily drops with the odor of $PrCO_2H$. The insol. part was only slightly sol. in EtOH. The insol. part was treated with Na_2CO_3; the soln. filtered and acidified with HCl pptd. a brick-yellow substance which m. and reddens 120–30°. The Ag salt of this contains 28.90% Ag. The remaining crude acid was dissolved in H_2O containing NH_3 and $AgNO_3$ was added, the dry Ag salt pptd. was suspended in cold EtOH for 1 day and finally gave analytical values for $C_{17}H_{17}O_2Ag$. This Ag salt (1.22 g.) suspended in EtOH and treated with 7 cc. 2.0 *N* HCl gave, finally, the acid $C_{17}H_{17}O_2$ as brick-yellow crystals, redden 75°, m. to a red liquid 125–30°, gives a red color with H_2SO_4. Thus mixts. of $PrCO_2H$ and BzPh exposed to sunlight undergo 2 reactions: (1) formation of $PrCO_2Pr$ which explains the formation of CO_2 and benzpinacol; and (2) the synthesis of an acid by the addition of 1 mol. BzPh with 1 mol. $PrCO_2H$. Now Paternò and Chieffi (*C. A.* 5, 2632) observed the formation of β-triphenyllactic acid from BzPh and $PhCH_2CO_2H$ and de F. uses the same explanation in this case, except that here there are 3 possible isomers depending on whether the reaction takes place at the α-, β- or γ-C atom of $PrCO_2H$. Thus (1) $Ph_2C(OH)CHEtCO_2H$, (2) $Ph_2C(OH)CHMeCH_2CO_2H$ or (3) $Ph_2C(OH)(CH_2)_2CO_2H$ may be formed. (1) is known and the product is not identical, (3) has not been excluded, but de F. considers the product to be (2), *i. e.*, *β-methyl-γ-hydroxy-γ-diphenylbutyric acid.* E. J. WITZEMANN.

Anhydrides and amines of α-amino acids. F. GRAZIANI. R. Politecn., Turin. *Atti accad. Lincei* 24, I, 822–7, 936–41(1915).—In a recent paper Balbiano (*C. A.* 9, 616) discussed results on the anhydrification of glycocoll by heating it with $C_{10}H_8$ or cymene and showed that this is not a peculiarity of glycerol as stated by Maillard but it is merely a question of temp. G. has continued these expts. with alanine, leucine, tyrosine and cystine and has obtained further data to show that M.'s hypothesis is based on error. The anhydride of alanine was obtained by heating with CH_2Ph_2 or acenaphthene; a compd. which seems to be an anhydride was obtained by heating leucine with CH_2Ph_2. Tyrosine and cystine treated in the same way failed to give anhydrides, but even when heated with glycerol the decompn. was very great and no pure and definite compds. could be isolated. Alanine heated 7 hrs. at 170–5° with glycerol gave 60% cycloalanylalanine (*a*), but heated with Ph_2CH_2 at 170–5° for 26 hrs. did not give the anhydride but underwent a slow decompn. into $EtNH_2$ + CO_2. By raising the temp. the decompn. into $EtNH_2$ + CO_2 is increased up to 80% but some (*a*) (up to 9%) is formed at the same time. This is explained as due to the fact that

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alanine and its anhydride are much more sol. in glycerol than in Ph_2CH_2. Mylius (*Ber.* **17**, 286) obtained an anhydride of sarcosine by heating this acid at its m. p., 220°, without the use of a dehydrating agent, but observed a partial decompn. into $Me_2NH + CO_2$; Maillard obtained cyclosarcosylsarcosine by heating the acid at 170–5° with glycerol. G. also obtained the decompn. into $Me_2NH + CO_2$ with glycerol but found it more marked at 220°. In the case of leucine the formation of the anhydride is more easily detd. with Ph_2CH_2 because the temp. of decompn. into amine and CO_2 is lower than for alanine. In fact, the latter heated at 170–5° with glycerol evolved ammoniacal vapors, while this does not occur with leucine: besides the odor of cacao, the odor of iso-$AmNH_2$ was detected and all the vapors evolved were alk. The iso-$AmNH_2$ carbonate-sublimate found by Maillard was not verified. Tyrosine behaves like leucine when heated with glycerol and gives anhydrification the preference: the amine is only formed in small amts., but with Ph_2CH_2 the $HOC_6H_4CH_2CH_2NH_2 + CO_2$ is formed almost quant. Cystine heated with either glycerol or Ph_2CH_2 gave no positive results and decomps., evolving H_2S, NH_3, CO_2 and deposits S and a tarry residue. All attempts to isolate an anhydride or sulfurated amine were in vain. The results seem to confirm the idea that the presence of glycerol is not necessary for the formation of the anhydrides of α-NH_2 acids. It serves as a moderator of the heat necessary by its avidity for H_2O and by the fact that it dissolves the NH_2 acids and their anhydrides somewhat, which facilitates the anhydrization by permitting a lower temp. For each of the NH_2 acids there is a temp. of max. anhydrization (lower) and a temp. of max. amine formation (higher) and at intermediate temps. both occur. It is evident that if a certain agent favors one of these reactions such as glycerol by its avidity for H_2O and its solvent action, that this reaction will be better developed in this case. For the exptl. details cf. original papers. E. J. WITZEMANN.

The velocity of phototropic transformations and their temperature coefficients with monochromatic light. M. PADOA AND A. ZAZZARONI. Univ. Bologna. *Atti accad. Lincei* **24**, I, 828–35(1915).—In a preceding note (*C. A.* **8**, 1368) it was demonstrated that the coloration of 2 phototropic substances follows the mass law for monomol. reactions. Without generalizing from these cases P. and Z. have examd. other phototropic substances of another type. The phototropic properties of derivs. of *p,p*-diaminostilbene-*o,o*-disulfonic acid (*a*) (Ac and Bz derivs. and K, Na, and other salts) are detd. by the action of O but it is not known to be a chem. reaction, *i. e.*, whether the O combines or whether it acts catalytically. In these expts. was used the Na salt of the di-Ac deriv., which is colored intensely red-purple. (*a*) was obtained by treating *p*-$MeC_6H_4NO_2$ with fuming H_2SO_4 for some days, giving *p*-nitrotoluenesulfonic acid which, purified as the Ba salt and liberated with H_2SO_4, m. 130°, hydrate (2 H_2O), m. 133°; it was oxidized to *p,p*-dinitrostilbenedisulfonic acid (*b*) with soda and NaClO. By reducing (*b*) with $FeSO_4$ in boiling concd. NH_3 soln., (*a*) was pptd. by adding HCl and was converted by boiling with Ac_2O + NaOAc into the *diacetyl derivative*, yellow cryst. powder insol. in H_2O, sol. in alkalies. The Na salt of the di-Ac deriv. (*c*) is colored intensely in the light and the intensity and velocity of the coloration depend on the degree of hydration of the salt, which is hygroscopic. The colorimetric scale necessary to measure the changes could not be obtained from (*c*) because it was so sensitive to light. That for the yellow form was prepd. from $MgCO_3 + K_2CrO_4$; the red from $MgCO_3$ + bengal red, A. T. + erythrosine + vesuvine. Expts. on the coloration at room temp. and different time intervals gave good velocity consts. for a bimol. reaction in each series, but the consts. for the series varied with the intensity of the light. The temp. coeff. from —10° to 20° was 1.21 or for a 10° interval. $K = \sqrt[3]{1.21} = 1.07$. The discoloration takes place with a velocity corresponding to a monomol. reaction. The temp. coeff. of this reaction is about 1.65. The temp. coeffs. in both reactions correspond

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closely with those found for other phototropic reactions. In this the coloration may be due to polymerization due to the light and a depolymerization due to heat and the equil. is $K'x = K''I(1 - x)^2$ where I is the intensity of the light. The effect of the O was not studied but it was present in excess in all the expts. Recently, Weigert and Kummerer (*C. A.* **7**, 2565) found that in acetone the mechanism of the reaction varies with the wave length so that if it obeys the mass law for a reaction of the 1st order with violet light it may react independent of the concn. with ultraviolet light. In order to test this out with (*c*) 3 light filters were prepd.: (1) a soln. of $CuCl_2$ and K_2CrO_4 gave green, wave length 540–505; (2) crystal violet and $CuSO_4$ gave blue, 478–410; (3) methyl violet gave violet, 437–394. The wave length was measured for the solns. used and when 2 compds. were used 2 flasks were used. When (*c*) was exposed to blue light (1) the consts. were the same as for white light. Expts. with salicylidene-β-naphthylamine with (1), (2) and (3) showed that the reaction is monomol. in all cases, but that with (1) the temp. coeff. is higher (1.80 from 40° to 70°) at high temps. than at low and higher than for white light (1.42 from 0° to 30°). With (2) the coeff. is 1.45 (40–70°) and with (3) it is 1.39 (0–70°). These results were obtained repeatedly and explain why the coeffs. for sunlight of different intensities varied so much as being due to variations in the relative intensity of the more active wave lengths. Trautz has maintained (*Z. Wissen. Photographie Photochem.* **4**, 351(1906)) that there is a parallelism between the wave length and temp. Further expts. are promised. E. J. W.

Autooxidation by light in the terpene series. I and II. E. Sernagiotto. Univ. Bologna. *Atti accad. Lincei* **24**, I, 850–4, 1065–7(1915); *Gazz. chim. ital.* **45**, II, 81–9 (1915).—The results obtained by Ciamician and Silber in the autooxidation of many compds. in the light have led S. to study the behavior of certain terpenes. 10 flasks (3 l.) full of O_2 containing 5 g. citronellal (*a*), purified through its $NaHSO_4$ deriv., with 100 cc. H_2O were exposed from June to Oct. On opening the flasks there was a strong aspiration, the liquid was strongly acid (33 cc. *N* $NaHCO_3$ were required to neutralize each). The product of the reaction was distd. with steam. The volatile part smelled like pulegone and was neutralized with $NaHCO_3$ and distd. again. The residue contained Na salts; the soln. was concd. and pptd. with $AgNO_3$ and gave a series of salts among which were the Ag salt of HOAc and heptylic acid. The last fractions contained much HCO_2Na. The aqueous volatile part contained neutral compds. which were concd. by repeated distns. and gave a yellow oil, b. 190–220°, which treated in EtOH with $NH_2CONHNH_2.HCl$ + KOAc gave much menthone semicarbazide, m. 184–5°, and little of a very sol. semicarbazide, prisms, m. 206–7°, corresponding to a ketone, $C_{10}H_{18}O$, *i. e.*, isomeric with (*a*) and menthone. Not all of the oil reacted. This portion was treated with CrO_3 in AcOH on the supposition that it was isopulegol and gave, finally, isopulegone semicarbazone, m. 173°. Acetone was detected in the aq. portion of the above distillate. The nonvolatile part of the 2nd distn. with steam was filtered to remove a little resin and was decolorized with animal charcoal and gave on evapn. a dense oil which crystd. slowly, m. 84°, and had the comp. of β-methyladipic acid. The liquid part taken up in H_2O was fractionally pptd. with $AgNO_3$ and gave a middle fraction of a white Ag salt of dihydroxycitronellic acid (*b*). The other fractions gave corresponding analyses. Citronellal undergoes rather complex changes in autooxidation in light. A part is isomerized to give isopulegol and menthone which it also gives by the action of acids or Ac_2O and on oxidation with CrO_3. Another isomerization product found was not identified. True oxidation products like (*b*) were first prepd. by the action of dil. cold $KMnO_4$ from (*a*) by Semmler. Acetone and β-methyladipic acid were also obtained but were 1st obtained from (*a*) by the action of dil. CrO_3 soln. on (*b*). The heptylic acid, which is no doubt β-methylhexylic acid, was obtained by a more gentle oxidation of (*a*). The analyses were done by Pregl microanalytic

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methods. *Autooxidation of pulegone.* 50 g. pulegone divided in 10 flasks (5 l.) full of O_2 containing 100 cc. H_2O were exposed to sunlight from June to Oct. The contents became acid and were partly tarred. After distg. with steam the volatile part was neutralized with $NaHCO_3$ and again distd. The non-acid volatile part contained acetone (*p*-bromophenylhydrazone, m. 94°) and pulegone (semicarbazide, m. 174°). The flask contained much HCO_2Na and traces of higher fatty acids. The nonvolatile residue of the 1st distn., sepd. from the tar, made alk. with $NaHCO_3$ and extd. with Et_2O, gave a cryst. compd. $C_{10}H_{14}O_3$, prisms, m. 183.5°, is not stable toward cold $KMnO_4$, is a lactone of a ketonic acid, and is insol. in carbonates, but sol. in alkalies, gives an insol. unstable Ag salt; the *oxime*, m. 116°, is more stable than the acid. By oxidising with CrO_3 mixt. β-methylglutaric acid, m. 86.7°, and acetone are formed. The alk. liquid gave on acidifying a brown oil, extractable with Et_2O, which gives Lieben's acetone reaction, and pptd. in part with $PhNHNH_2$, neutralized with NH_3 and treated with $CuSO_4$ a Cu salt was pptd. from which β-methyladipic acid, m. 84°, was obtained with H_2S. The oily residue pptd. fractionally with $AgNO_3$ gave a Ag salt of an *acid*, $C_{10}H_{18}O_3$, of unknown constitution. In autooxidation with light pulegone reacts in part as it does with $KMnO_4$ (*idem* **16**, I, 835(1907); **17**, I, 179(1908); **17**, I, 577; **18**, I, 317), giving acetone and β-methyladipic acid. It also gives a ketolactone, $C_{10}H_{16}O_3$, which by oxidation gives acetone + β-methylglutaric acid. It is considered probable that in this transformation $CMe_2{:}C{:}CHCH_2CHMeCH_2CHO$, $CMe_2{:}C(OH)$-$CH(OH)CH_2CHMeCH_2CO_2H$ and an ε-ketolactone, $CMe_2{:}C.CO.CH_2.CHMe.CH_2.CO.O$ are intermediate products.

E. J. WITZEMANN.

d-**Lyxohexosaminic acid and** α,α'**-anhydromucic acid.** P. A. LEVENE AND F. B. LAFORGE. Rockefeller Inst. *J. Biol. Chem.* **22**, 331–5(1915); cf. *C. A.* **9**, 1768, 2078.—*d-Lyxosimine* was obtained by the action of dry MeOH satd. at 10° with NH_3 on finely ground cryst. *d*-lyxose; m. 142–3° (uncor.). *d-Lyxohexosaminic acid*, from lyxosimine by the action of HCN, darkens slowly above 180° and decomps. about 215°; in 2.5% HCl soln., $[\alpha]_D^{25}$, after 15 min., —3.58°; after 44 hrs., —20.72°. *α,α'-Anhydromucic acid*, from lyxohexosaminic acid by deaminization with $AgNO_3$ and subsequent oxidation with concd. HNO_3, m. 203–4° (cor.); the acid is optically inactive.

A. P. LOTHROP.

Complexes of vanadic acid with citric acid (BARBIERI) 6. Sulfonation of hydroquinone (PINNOW) 2. The refraction and dispersion capacity of silicon in organic silicon compounds (BYGDÉN) 2. The visualization of the space lattice of crystals by Röntgen rays (LAUE) 2. Equilibria of hydrogenation (PADOA) 2. Saponification of esters by alkalies (WEGSCHEIDER) 2. Kinetics of the reaction of alcoholic hydrochloric acid with phthalic acid and its esters (WEGSCHEIDER) 2.

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11. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

FRANK P. UNDERHILL.

Surface tension and ferment action. E. BEARD AND W. CRAMER. *Proc. Roy. Soc. London* (*B*) **88**, 575(1915).—Changes in surface tension were produced in invertase prepns. by the introduction of glass beads. An increase in the surface of the system retards the action, for the surface-active enzyme is driven into the surface layer, combining with the surface-inactive sucrose. This effect of surface tension

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may also be caused by a retardation of the chemical action taking place in the substrate, but this cannot as yet be definitely shown. Other enzymes than that studied may exhibit a different effect depending upon the enzyme, substrate, products, and amt. of surface change but the authors believe that a similarity of action in this respect is fairly general. H. W. BANKS, 3RD.

Forms of growth resembling living organisms and their products, slowly deposited from metastable solutions of inorganic colloids. B. MOORE AND W. G. EVANS. *Proc. Roy. Soc. London* (*B*) **89**, 17(1915).—Sterilized tubes containing Na_2SiO_3 and $Fe(NO_3)_3$ in proportions such as to produce metastability in the resulting colloid were sealed, heated in the autoclave and opened after seven months. Forms resembling living organisms were observed under the microscope. Addition of small amts. of Na_2CO_3 before sealing did not alter the results. Microphotographs are given.

H. W. BANKS, 3RD.

The production of growths or deposits in metastable inorganic hydrosols. B. MOORE. *Proc. Roy. Soc. London* (*B*) **89**, 27(1915); cf. preceding abstr.—Attempting to hasten growth by increased concn. caused less satisfactory results. The expts. were further extended to colloidal S, silicic acid and $Fe(OH)_3$. H. W. BANKS, 3RD.

The chemistry of coat color in animals and of dominant and recessive whiteness. H. ONSLOW. *Proc. Roy. Soc. London* (*B*) **89**, 36(1915).—O. criticizes the work of Durham (*Proc. Roy. Soc. London* **74**, 310(1904)) regarding the existence of tyrosinase in the skins of vertebrates. However, a peroxidase can be extd. from the skins of colored rabbits and mice which behaves like tyrosinase towards tyrosine in the presence of H_2O_2. No peroxidase can be extd. from yellow or orange rabbits, but brown and black coat color is due to the action of tyrosinase upon a chromogen, and dominant whiteness in the English rabbit is due to a tyrosinase inhibitor. Recessive whiteness is due to lack of enzyme unit, for no tyrosinase or antityrosinase could be extd. This is not sufficient evidence of the presence or absence of a chromogen. The presence of an unoxidized chromogen might serve to explain the occurrence of certain colorless granular particles in the medullary cells of the hair of some white animals. Skin exts. oxidize dihydroxyphenols but not monophenols. This is due to the catalyzing effect of org. colloid material and not to a true enzyme. This is confirmed by its resistance to high temps. Pigments from differently colored rabbits show very little difference. Difference of color seems to be quant. rather than qual.

H. W. BANKS, 3RD.

The transmission of infra-red rays by the media of the eye, and the transmission of radiant energy by Crookes and other glasses. H. HARTRIDGE AND A. V. HILL. *Proc. Roy. Soc. London* (*B*) **89**, 58(1915).—Expts. to det. what amounts of different infra-red radiations gain access to the deeper structure of the eye and what proportion of these radiations is absorbed by the lens. The app. is described and methods of observing the absorption by the aqueous humor, vitreous humor, lens, and cornea are given. In each case curves are given for transmission and absorption from 7,000 to 20,000 Å. Based on these results, samples of glass designed to screen out harmful radiations were tested. The best glass for this purpose had the comph.: soda flux 96.8, Fe_2O_4 2.85, C 0.35%. H. W. BANKS, 3RD.

Surface tension as a factor controlling cell metabolism. W. CRAMER. *Proc. Roy. Soc. London* (*B*) **89**, 584(1915).—C. cites the example of a liver cell as acting very differently *in vivo* and *in vitro*. In the former case glycogen is synthesized, while in the latter, glycogenolysis is the principle reaction. This may be attributed to a marked shift in the equilibrium point of the reaction due to the very different surface conditions of the 2 cases. In the body the removal and deposition of glycogen by sur-

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face action would favor the synthesis of more glycogen, while *in vitro* the opposite effect would be expected. Furthermore, substances shown by Loeb to affect the metabolism of unfertilized eggs, (narcotics, saponin, soap, bile salts) are strongly surface active.

H. W. BANKS, 3RD.

Biochemical synthesis of α-mono-*d*-galactoside of ethyleneglycol. E. BOURQUELOT, M. BRIDEL AND A. AUBRY. *Compt. rend.* **160**, 674–6(1915).—The authors have prepd. α-mono-*d*-galactoside of ethyleneglycol by means of the enzyme α-galactosidase contained in bottom yeast. The galactoside is made up of colorless needles, shaped like a roset. It tastes slightly sweet and is sol. in water and alc. It m. 134° (as does the β form), $[\alpha]_D$ +169.9° at a concn. of 1.7848 parts per 100. It does not reduce Fehling soln. It is hydrolyzed by warming with H_2SO_4 at 100° for 6 hrs. The rotation changes from +3° 2′ to +1° 8′, corresponding to 0.700 g. of reducing sugar per 100 cc. These results correspond to a monogalactoside: $C_6H_{11}O_5.O.CH_2.CH_2OH$. It is hydrolyzed by macerated bottom yeast, the rotation changing in 10 days from +3° 2′ to +2° 10′. H. D.

Influence of acetic acid upon synthesizing and hydrolyzing properties of α-glucosidase. N. BOURQUELOT AND A. AUBRY. *Compt. rend.* **160**, 742–5(1915); *J. pharm. chim.* **12**, 15–22.—The activity of α-glucosidase is destroyed by very small amts. of AcOH. The fact that both the synthesizing and hydrolyzing powers are lost at the same time suggests that these two properties belong to one and the same enzyme.

H. D.

Some observations on the amylase of malt. P. PETIT. *Compt. rend.* **161**, 39–40 (1915).—Solns. of amylase obtained with water, whether pure or mixed with alc., do not last long and contain a large proportion of foreign matter. A soln. of diastase which will maintain its activity for several weeks is prepd. as follows: Finely powdered malt is infused for 24 hrs. in acetone dild. with water (30 or 35 parts of water to 100 parts of acetone by vol.). The infusion is filtered and kept in the dark. The diastatic power of malt estd. in the usual manner in this fresh soln. is 30; after 48 hrs. it falls to 18, which value it maintains for about 20 days. The action of light is destructive and causes an increase in acidity. The destruction of diastase is greatly accelerated by the addition of a drop of eosin. By pptn. with ether a dry diastase may be obtained. H. D.

Toxicity of extracts of organs. H. DOLD. *J. State Med.* **22**, 630–3(1914).—Exts. of lungs, lymphatic glands, livers, nervous tissues, brains, muscles, and testicles, when injected intravenously into heterologous or homologous animals proved fatal. The poisonous substance is not peculiar to certain organs alone, but is present in all tissues and organs. The poison is obtained by triturating the tissue or organ in a mortar with about 10–12 cc. normal saline soln.. After about 5 min. the pulp is filtered through a paper filter and injected into the ear vein of a healthy rabbit or guinea pig; 3–4 cc. of ext. kills a rabbit in 1–3 minutes. Attempts to immunize animals against their own organ poisons gave negative results. The author shows that the proportion of extractable organ poison is parallel to the proportion of contained lymph. H. D.

Optical and other properties of trypsin. M. A. RAKUZIN AND G. D. FLIER. *J. Russ. Phys. Chem. Soc.* **47**, 1048–9(1915).—Expts. with trypsin similar to those previously made with pepsin (*C. A.* **9**, 1488) showed that it differs from the latter in being optically inactive and in not being decompd. by Al_2O_3. These differences may be ascribed to a difference in constitution. H. M. GORDIN.

Optical properties of albuminous substances. M. A. RAKUZIN. *J. Russ. Phys. Chem. Soc.* **47**, 1050–4(1915).—Detns. of H_2O, fat, ash and the compn. of the latter in purified albumin. The sp. gr. of crude albumin fluctuated between 1.0425 and 1.0525.

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Tables are given for the optical rotation of numerous samples of crude albumin and their positive and negative adsorption by Al_2O_3 (cf. *C. A.* **9**, 1488). In undil. condition centrifugalization fails to sep. anything from albumin. Under the microscope it is seen to be amorphous. The part of albumin adsorbed by Al_2O_3 probably is also amorphous. Attempts to recover by extn. the albumin adsorbed by Al_2O_3 so far have been unsuccessful. H. M. GORDIN.

Adsorption of pepsin from its aqueous solution by aluminium oxide. M. A. RAKUZIN AND E. M. BRAUDO. *J. Russ. Phys. Chem. Soc.* **47**, 1055–6(1915).—About 12.4% of pepsin is removable from its soln. by digestion with Al_2O_3 (cf. *C. A.* **9**, 1488). If the mixt. is filtered and the filtrate digested with a fresh portion of Al_2O_3 no more pepsin is taken up by the latter. The adsorption is an irreversible process, repeated digestion with warm H_2O failing to ext. the pepsin adsorbed by Al_2O_3. Pepsin is partly cryst. H. M. GORDIN.

Optical rotation of albumin-peptone and its adsorption by aluminium oxide. M. A. RAKUZIN AND E. M. BRAUDO. *J. Russ. Phys. Chem. Soc.* **47**, 1057–9(1915).—The rotation of ordinary albumin-peptone (*a*) is $[\alpha]_D = -95.24°$. Like albumin (*C. A.* **9**, 1488), *a* is decompd. by digestion with Al_2O_3 into 2 modifications, one of which is adsorbed, while the other remains in soln. The rotation of the former is $[\alpha]_D = -156.68°$, while that of the latter is $[\alpha]_D = -75°$. The adsorption (24.19%) is completed by a single digestion, and is irreversible, it being impossible to recover the *a* by extn. The latter is amorphous. H. M. GORDIN.

The relation of uricolysis to suboxidation. FREDERIC G. GOODRIDGE AND NELLIS B. FOSTER. New York. *Arch. Intern. Med.* **10**, 414(1912); *Biochem. Bull.* **2**, 292–3 (1913).—In order to investigate the subject of diminished oxidation in its relation to uric acid excretion, cases were studied of poisoning by illuminating gas (people) and by KCN (dogs). The retardations of the oxidizing processes, either by deprivation of O (gas) or by interference with cellular functions (KCN), were not followed by increased excretion of uric acid. It appears improbable that uric acid destruction in the body is a simple oxidizing process. A. P. LOTHROP.

Protein-copper compounds. SIDNEY BORN. Columbia Univ. *Biochem. Bull.* **2**, 166(1912).—Protein-Cu compds. are formed when concd. solns. of indiffusible proteins are treated with NaOH and $CuSO_4$ solns. and the excess is removed by dialysis. In 6 preps. made from edestin, gelatin and serum protein the % of Cu varied from 4.2 to 6.3%. Injected subcutaneously into frogs, the edestin and gelatin products caused death in 3 hrs. A. P. LOTHROP.

A non-protein, colloidal, nitrogenous substance in milk. MAX KAHN AND FREDERIC G. GOODRIDGE. Columbia Univ. *Biochem. Bull.* **2**, 178–9(1912).—After a careful process, including the removal of protein without hydrolysis, a substance, which was white, amorphous, odorless and tasteless was obtained from milk; insol. in lipin solvents, but forms in H_2O an opalescent soln. which does not flocculate on boiling. It does not respond to any of the protein color tests. It contains about 5.3% N, also C, H, O and S, but no loosely combined NH_2 radicals. A. P. LOTHROP.

The diffusion of iodo-eosin from ether through rubber into ether. JACOB ROSENBLOOM. Univ. Pittsburgh. *Biochem. Bull.* **2**, 290–1(1913).—The acid form of iodo-eosin (mol. wt. 836) diffuses rapidly from Et_2O soln. through rubber into Et_2O. A. P. LOTHROP.

The preparation of histone from flounder sperm. WALTER H. EDDY. Columbia Univ. *Biochem. Bull.* **2**, 291–2(1913).—Histone prepared from the testes of cold-storage flounders resembles thymus histone (*C. A.* **7**, 2758) in its properties. A. P. LOTHROP.

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Biochemical studies of expired air in relation to ventilation. CHARLES WEISMAN. *Dissertation*, Columbia Univ. 1913; *Biochem. Bull.* 2, 295–6, 558(1913).—Eleven repetitions of Rosenau and Amoss' expts. (*C. A.* 5, 3590) were made with negative results in each case. Anaphylaxis failed to occur in control expts., when expired-air condensations were used for the second injection as well as for the preliminary sensitization. Guinea pigs that were "sensitized" to the condensation-liquids, obtained by drawing air through the macerated lungs from a dog, failed to exhibit anaphylaxis after treatment with dog-blood serum. The liquid obtained by drawing air through a soln. of Witte peptone and condensing the vapors did not yield positive protein tests. Chem. exam. of the condensation liquids, obtained from the expired breath of several persons under aseptic conditions, showed the presence of NH_3 and Cl^- and the absence of S^{--}, PO_4^{---}, Br^-, I^-, amine, Me_2CO, diacetic acid and protein. The ill effects of vitiated air in poorly ventilated or overcrowded places cannot be due to a volatile protein ("sensitizing substance") from the lungs. (Cf. *C. A.* 8, 2403.) A. P. L.

A study of uroerythrin. BEATRIX H. GROSS. Columbia Univ. *Biochem. Bull.* 2, 466–7(1913).—Colorless Na urate was dissolved in urochrome exts., prepared from both human and dog urines by satg. the urines with PhOH, the solns. were acidified for the sepn. of uric acid and the deposited crystals of uric acid examined microscopically for uroerythrin. All the crystals thus obtained were colored in the familiar way with uroerythrin, as when sepd. from normal urine. A. P. LOTHROP.

The content in expired air of protein detectable by the anaphylactic reaction. DANIEL R. LUCAS. College of the City of N. Y. *Biochem. Bull.* 2, 545–6(1913).—Intraperitoneal injections (2–15 cc.) of condensations from the expired air of dogs did not sensitize guinea pigs to dog serum. Guinea pigs exposed to dog exhalations for a week, under conditions of poor ventilation, were not sensitized, nor were any evidences of sensitization to human serum obtained when pigs were exposed for a week in the exit of a ventilation system in a college building containing many people daily. The results do not support the conclusions of Rosenau and Amoss (*C. A.* 5, 3590).
A. P. LOTHROP.

Histone nucleoprotein: a protein salt. WALTER H. EDDY. Columbia Univ. *Biochem. Bull.* 2, 548–9(1913); cf. *C. A.* 7, 615, 2758.—The ppt. obtained by adding a neutral aq. soln. of thymus histone to a neutral soln. of yeast Na nucleoprotein is insol. in H_2O, sol. in 0.05% Na_2CO_3 and repptd. by 0.1% HCl. The 0.05% Na_2CO_3 soln. is pptd. by concd. HNO_3, picric acid, alc., $HgCl_2$, neutral Pb acetate but not by NH_4OH, Na phosphotungstate, $K_4Fe(CN)_6$, KI, HgI_2 or albumin. The compd. was shown to contain histone. A. P. LOTHROP.

Two new histones. WALTER H. EDDY. Columbia Univ. *Biochem. Bull.* 2, 548(1913).—Histones have been prepared from tom-cod milt and shad milt by methods previously described (*C. A.* 7, 2758). They resemble thymus histone in their general properties. A. P. LOTHROP.

The action of the high frequency current on the activity of pancreatic amylase. P. W. PUNNETT. Columbia Univ. *Biochem. Bull.* 2, 555–6(1913).—Solns. of com. pancreatin were treated with the current in a beaker coated on the outside with tinfoil attached to one terminal and having a Pt electrode, connected with the other terminal, immersed in the soln., the whole being kept in an ice bath. The length of treatment varied from 5 to 30 min. and the hot-wire ammeter gave a reading of 500–600 milliamps. Treatment of a fresh enzyme soln. for 3–20 min. is probably beneficial, giving an increase of from 5 to 20% in activity; longer treatment is without effect. The effect is directly opposite to that induced by the direct current.
A. P. LOTHROP.

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A further study of the distribution of osseomucoid. CHRISTIAN SEIFERT AND WM. J. GIES. Columbia Univ. *Biochem. Bull.* **2**, 556(1913).—Osseomucoid has been sepd. from the main limb bones (or skull) of the following additional species: *mammals:* monkey (mangabey and spider), horse, fox, raccoon, white rat; *birds:* dove, meadow hen; *fish:* sculpin. A. P. LOTHROP.

Isolation of vitamine from rice polishings. ALLAN C. EUSTIS AND L. C. SCOTT. Tulane Univ. *Biochem. Bull.* **3**, 466–7(1914).—A concd. ext., obtained from 2 kg. of rice polishings by pptn. with phosphotungstic acid and decompn. of the ppt., cured chickens suffering from *Polyneuritis gallinarum* in 4–6 hrs. when injected into the pectoral muscles. The quantity of substance was small and the cures by no means uniformly obtained, but 2 expts. with chickens in violent convulsions demonstrated beyond a doubt that some curative substance must have been present. A. P. LOTHROP.

Some products of hydrolysis of gliadin, lactalbumin, and the protein of the rice kernel. T. B. OSBORNE, D. D. VAN SLYKE, C. S. LEAVENWORTH AND MARIAM VINOGRAD. Conn. Agr. Expt. Station and the Hosp. of the Rockefeller Inst. *J. Biol. Chem.* **22**, 259–80(1915).—Analysis of gliadin for its lysine content by the picrate method gave an amt. equal to 0.64% of the ash-free protein; 1.21% was obtained from the N partition by the Van Slyke method. These are, resp., minimum and max. figures; the true lysine content may be stated as 0.93 ± 0.28%. Hitherto gliadin has been regarded as practically lysine-free. The histidine content is 1.84 ± 0.35% and the arginine content 2.84 ± 0.14%. The amt. of N yielded by gliadin as NH_2 corresponds closely with that required for amide union with 1 carboxyl group of the larger amt. of glutaminic and aspartic acids recently obtained from gliadin, and the N yielded as NH_2 by acid hydrolysis probably exists in the molecule in acid-amide form as in asparagine and glutamine. One of the 2. NH_2 groups of lysine exists free in the protein mol., the free group being probably the ω-NH_2 group. The hexone base content of lactalbumin is as follows: lysine 9.16 ± 0.68%; histidine 2.06 ± 0.54%; arginine 3.23 ± 0.23%. Lactalbumin is especially rich in lysine. "Compared with the endosperm proteins of wheat or maize, the protein of rice yields relatively much of the basic amino-acids, arginine, histidine and lysine, and comparatively little NH_2 and non-amino N. In its general amino-acid make-up it more nearly resembles the majority of the proteins of animal tissues than do the proteins of maize and wheat. This may explain the extensive use of rice as an almost exclusive diet in spite of its low protein content." A. P. LOTHROP.

The action of aseptic tissue on glucosone. P. A. LEVENE AND G. M. MEYER. Rockefeller Inst. *J. Biol. Chem.* **22**, 337–9(1915); cf. *C. A.* **8**, 3308.—The action of aseptic rabbit kidney tissue on glucosone was studied. The glucosone soln. remained unchanged in all the expts. and its reducing power for Fehling soln. and $KMnO_4$ was not altered. The results indicate "that only the unchanged hexose mol. is affected by the tissue enzyme, and that only the unchanged hexose undergoes cleavage into 2 mols. each containing a chain of 3 carbons. This in turn may signify that the first step in the process of lactic acid formation from sugar consists in the dissociation of the hexose mol. into 2 of glyceric aldehyde. Perhaps this phase is the part of a special enzyme." A. P. LOTHROP.

Acidity of undiluted normal gastric juice from a case of human gastric fistula. M. L. MENTEN. *J. Biol. Chem.* **22**, 341–3(1915).—The H ion concn. of various samples of gastric juice (undild. with saliva) from a gastric fistula subject, with complete cicatricial stenosis of the esophagus, was detd. by the gas chain method. In 24 samples the values for p_H varied from 0.92 to 1.58, the lower results being obtained on "appetite" juice, produced by the stimulation of the gustatory mechanism and

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on "hunger" juice, where continuous secretion obtains, and the higher results on "empty stomach fluid," taken 1 hr. after the stomach had been washed out with 100 cc. of H_2O. A. P. LOTHROP.

A spectroscopic examination of the color reactions of certain indole derivatives and of the urine of dogs after their administration. ANNIE HOMER. Lister Inst. and Univ. of Toronto. *J. Biol. Chem.* **22**, 345–61(1915).—"A study of the absorption spectra of the colored substances obtained by the action of certain reagents on indole derivs. has been made and correlated with those derived from the chromogens eliminated in the urine of dogs to which these indole derivs. had been administered. Indole, skatole, indole-aldehyde, indolecarboxylic and indoleacetic acids undergo little change in their passage through the animal body. More deep-seated changes take place with indolepropionic acid. Tryptophan under normal conditions is not apparently broken down into any of the above named substances before absorption from the alimentary tract." The urorosein reaction is due to the presence of indoleaceturic acid produced from indoleacetic acid in the intestines as the result of bacterial action on tryptophan. The skatole red pigment has the same spectrum as urorosein but consists of a mixt. of 2 pigments which can be isolated by the use of suitable solvents and which are more stable and differ from urorosein in soly. The urine of dogs gives a strong indican reaction within a short time after the administration of indole and indolealdehyde; this persists for several days. The indican reaction appears on the second day after the administration of skatole but indican is not present in the urine after the ingestion of other indole derivs. "The presence of indoxyl compounds in pathological human urines may be due to disorders of the liver whereby the liver cells may be incapable of dealing with tryptophan beyond the stage of indolealdehyde or to the absorption from the intestinal tract of indole or of indolealdehyde produced from tryptophan by the action of intestinal bacteria." A. P. LOTHROP.

The kyrine fraction obtained on the partial hydrolysis of protein. II. P. A. LEVENE AND J. VAN DER SCHEER. Rockefeller Inst. *J. Biol. Chem.* **22**, 425–32 (1915); cf. *C. A.* **7**, 354.—The kyrine obtained on the partial hydrolysis of casein was fractionated into two portions by the methods employed in a similar expt. on gelatin. Each of the 2 fractions was further sepd. into 2 parts, one forming a phosphotungstate sol. in hot H_2O and the other an insol. phosphotungstate. From one of the fractions which was obtained a sulfate had the macroscopic appearance and character of a cryst. substance. It was not hygroscopic and sepd. in long, glistening needles. All the basic N was present in the form of amino N, the peptide containing, therefore, only lysine, which was isolated as the picrate in the theoretical amt. The elementary analysis showed that the substance was a tripeptide composed of lysine, oxyproline and valine, but the authors as yet have been unable to isolate and identify the amino acids other than lysine. "However, the principal fact was established, namely, that the casein kyrine can also be fractionated into simple peptides each containing in its mol only one basic substance." A. P. LOTHR

The oxidation of cholesterol. F. W. LAMB. *Proc. Physiol. Soc.; J. P* **48**, lvi(1914).—Cholesterol is oxidized to oxycholesterol (1) when heated above with access of air, (2) when heated in AcOH or $C_3H_5(OH)_3$, (3) when mixed with acids at body temp. Quant. detn. of cholesterol should not involve drying of tis Properties of the oxidized cholesterol-fatty acid mixt. explain some of the difficu in detecting microchem. the presence of cholesterol after absorption when it has be fed in fatty acid mixts. J. F. LYMAN.

Paul Ehrlich. BECHHOLD. *Chem. Ztg.* **39**, 705–8(1915).—A review of his work in biological chem. J. H. MOORE.

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Influence of polyhydric phenols and phenolcarboxylic acids on the enzymotic hydrolysis of proteins by pepsin in an acid medium. LUIS GUGLIALMELLI. *Anales soc. quim. Argentina* **2**, 186–95(1914).—G. has studied the influence of phenols (PhOH, *o*-, *m*-, and *p*-$C_6H_4(OH)_2$, and 1,2,3-, 1,2,4- and 1,3,5-$C_6H_3(OH)_3$) and carboxyphenols (salicylic, gallic and tannic acids) on the action of pepsin in an acid medium, the procedure being in accordance with the Mett method. PhOH produced a white ppt. in concd. solns. The liquid to which 1,2,3-$C_6H_3(OH)_3$ was added became dark-colored by oxidation and the surface of the albumin cylinders assumed an intense dark brown color. In the case of 1,2,4-$C_6H_3(OH)_3$ the liquid was clear and reddish in color. 1,3,5-$C_6H_3(OH)_3$ produced an abundant white ppt. in the case of the higher concns. Salicylic acid produced an abundant ppt. in higher concns. and turbidity in lower concns. The liquid to which gallic acid was added remained perfectly clear. Tannic acid produced voluminous ppts. at higher concns. and turbidity at lower concns. The inhibiting action of these substances (at various concns.) on peptic digestion is indicated by tabulated data. Comparison of these data (especially for the various phenols) shows that the position of the active substituent group in the mol. has more influence on the degree of retardation of peptic digestion than has the number of these groups in the mol.; the inhibiting action of the polyhydric phenols was much less than that of PhOH. Tannin is remarkable for its intense inhibiting action, the latter being manifest in a concn. as small as 1:25,000; this action is doubtless due to pptn. of the enzyme. G. compares the action of tannin with its tanning action and also with the inhibiting influence of various pigments on peptic digestion. In a previous paper (*C. A.* **5**, 3159) G. and Damianovich showed that peptic digestion is inhibited by those pigments which are fixed by animal fibers in an acid medium. H. S. PAINE.

Action of some enzymes on the carbohydrates of yeast. J. GIAJA. *Compt. rend. soc. biol.* **77**, 2–4(1914).—Pancreatic juice slowly hydrolyzes the glycogen of yeast cells which have been killed by boiling; the digestive fluid of the snail effects this hydrolysis almost instantaneously. The latter doubtless contains enzymes which completely dissolve the cellular membrane, while the pancreatic juice does not produce such an effect. The digestive juice of the snail also produces reducing sugar by its action on yeast which has been deglycogenized; in 4 expts. 15.8, 18.2, 18.4 and 20.7 g., resp., of sugar calcd. as glucose were obtained from 100 g. of dried yeast. Hydrolysis with 10% HCl in an autoclave at 120° for 2 hrs. yielded 33% of reducing sugar. The digestive fluid of the snail does not, therefore, hydrolyze all the carbohydrate material of yeast. Glucose and mannose were produced by the acid hydrolysis of deglycogenized yeast; hydrolysis by the digestive fluid of the snail produced glucose and a small amt. of mannose. H. S. PAINE.

The importance of tyrosine as an aid in the demonstration of the present day (de novo) origin of living organisms. H. C. BASTIAN. *Proc. Roy. Soc. Med.* **8**, 55–68(1915).—Tyrosine, which induces reproduction in amebae, causes a rapid proliferation in B.'s organisms (?) obtained by the process of "archebiosis" or spontaneous generation. He cites this fact as evidence that the bodies appearing after long periods in sealed sterile tubes are true organisms and not simulacra. A. H. RAHE.

The chemical-colloidal mechanism of senility and the problem of natural death. G. MARINESCO. *Bull. acad. sci. Roumanie* **2**, 148–54(1913–4); *Chem. Zentr.* **1915**, I, 1135.—A review and discussion of the literature. F. W. SMITHER.

Carboxylase and other yeast enzymes. CARL NEUBERG. Kaiser Wilhelm Inst. *Biochem. Z.* **71**, 1–103(1915).—New expts. are reported which confirm the earlier observations as to the great stability of carboxylase after being sepd. from the yeast cells and also in dry prepns. That dialysis does not inactivate carboxylase (zymase is completely inactivated) follows from expts. on Berlin bottom yeasts UM and K.

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A fermentation mixt., in which the activity of the zymase has ceased, still contains active carboxylase. In some cases, however, its activity has been more or less decreased. The resistance of carboxylase is favorable to the view (Buchner, Hardin) that the inactivation of the zymase is caused by the destruction of the so-called coenzyme; such an enzyme is not necessary for the activity of carboxylase. Carboxylase is also active after being kept 27 days at 0°. It reacts with pyruvic and other keto acids at temps. between 10–15° and 18–20°, and when either fresh or dried yeast prepns. are used. The max. temp. at which carboxylase will act is 70° for fresh yeast, 65–68° for yeast prepns. Zymase parallels the action of carboxylase in fresh yeast, but that of the yeast prepns. loses its activity at 51°. The action of carboxylase upon free pyruvic acid is very slow. It proceeds much more rapidly when K_2HPO_4, $Na_2B_4O_7$, or K_2HAsO_3 is added. An attempt further to differentiate between zymase and carboxylase by the action of acids and alkalies failed, in that both either survived the treatment or were destroyed. The action of 50 cc. 0.5 *N* NaOH upon 100 cc. maceration juice for 15–30 min. at 37°, followed by neutralization with 0.1 *N* HCl, did not materially decrease the activity of either enzyme. The addition of the following org. compds. had little or no effect upon the activity of carboxylase: EtOH, MeOH, *n*-PrOH, isopropyl alc., amyl alc., glycerol, MeCHO, aldehyde-ammonia, propyl aldehyde, acetone, pyridine. The higher keto-acids react with carboxylase more rapidly in the free form than in the presence of the salts mentioned above. Plasmolyzed yeast shows a vigorous carboxylase action. The action of invertase is entirely independent of carboxylase. The salts of pyruvic acid have no effect upon invertase. Free pyruvic acid completely stops the action of zymase and carboxylase. Small amts. of the salts of pyruvic acid activate the fermentation of all sugars except *d*-galactose. The same stimulation of zymase was found with many other keto-acids. (Cf. Neuberg and Schwenk (following abstract).) In all cases the stimulation is more marked at 28° than at 37°. Very small amts. of carboxylase are active. An invertase soln. has been kept 800 days without decreasing its activity. C. J. West.

Fermentation of dihydroxymaleic acid. Carl Neuberg and Erwin Schwenk. Kaiser Wilhelm Inst. *Biochem. Z.* 71, 104–13(1915).—Different kinds of yeasts, including dry yeast and yeast maceration juice, split dihydroxymaleic acid into CO_2 and glycollic aldehyde. The product was isolated as the osazone, which was freed from the osazone of hydroxypyruvic acid (from dihydroxymaleic acid by the action of AcOH.PhNHNH$_2$) by extn. of the latter with Na_2CO_3. C. J. West.

Relation of carboxylase to zymase. Carl Neuberg. Kaiser Wilhelm Inst. *Biochem. Z.* 71, 133–4(1915).—The organisms described by Klocker (*C. A.* 8, 1292) contain little if any carboxylase. Since they do not ferment sugar, this agrees with the earlier observations that carboxylase and zymase fermentations are parallel. C. J. West.

Coenzyme-like action of the salts of α-keto-acids. Carl Neuberg and Erwin Schwenk. Kaiser Wilhelm Inst. *Biochem. Z.* 71, 135–43(1915).—A mixt. of the K or Ca salts of pyruvic, α-ketobutyric, α-ketoisovaleric, α-ketocaproic, phenylglyoxalic, phenylpyruvic, *p*-hydroxyphenylpyruvic, hydroxypyruvic, oxalacetic and α-ketoglutaric acids is capable of activating "co-enzyme-free" yeast maceration juice as well as the "co-enzyme-free" dry yeasts, so that they ferment grape sugar, fructose and cane sugars. C. J. West.

Biochemistry of the action of light rays. IV. Photochemical formation of indigo from indican. Carl Neuberg and Erwin Schwenk. Kaiser Wilhelm Inst. *Biochem. Z.* 71, 219–25(1915).—K indoxylsulfate, treated with sunlight in the presence of various catalyzers, loses H_2SO_4 and is changed to indigo. C. J. West.

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The course of the natural formation of lactic acid. CARL NEUBERG AND JOH. KERB. *Biochem. Z.* 71, 245–54(1915).—Polemical against Oppenheimer (cf. *C. A.* 9, 924). C. J. WEST.

Stimulating action of magnesium salts on lactic fermentation. C. RICHET. *Compt. rend.* 161, 264–5(1915).—R. has previously shown (*Compt. rend.* 114, 1494(1892)) that all metallic salts stimulate lactic fermentation, the most active being salts of Mg. In this paper R. shows that with increasing amts. of $MgCl_2$ the quantity of acid formed increases up to a certain point and then diminishes rapidly, the max. being obtained with 12.5 g. of $MgCl_2.6H_2O$. H. D.

Action of ureases in the destruction of organic matter. F. BORDAS AND S. BRUÈRE. *Compt. rend.* 161, 285–7(1915).—The ureases, under proper conditions of moisture and temp., are more effective than other enzymes in the destruction of org. matter. At room temp., a guinea pig weighing 680 g. was destroyed in 360 hrs. A horse weighing 600 kg., buried in a dung hill, was destroyed in three weeks. H. D.

Laws of photochemical reactions for discontinuous illumination (LAZAREV) 2.

B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

A comparison of methods for determining the respiratory exchange of man. THORNE M. CARPENTER. *Carnegie Inst. Pub.* No. 216, 265 pp., 74 figs.(1915).—This publication gives the results of an extensive series of investigations upon the comparative value of a number of methods used for the detn. of the respiratory exchange of man. The first part contains a review of previous work and a detailed description of the methods and app. used in the research reported, *viz.:* Bed respiration calorimeter; the two forms of the Benedict universal respiration app., *i. e.*, tension-equalizer unit and spirometer unit; Zuntz-Geppert, Tissot, and Douglas app.; the Haldane gas analysis app.; and minor accessory app. The results of the various comparisons of app. follow. The bed respiration calorimeter was made the standard for normal respiratory exchange. Normal, healthy young men were used as subjects and the comparisons of any 2 app. were made on the same day under like conditions of muscular repose and nutrition. The CO_2 elimination, O absorption, respiratory quotient, pulse-rate, respiration-rate, and, when possible, total ventilation of the lungs and vol. per respiration were detd. A series of comparisons of the respiratory exchange obtained with the bed calorimeter and tension-equalizer unit showed agreement in the values for the CO_2 elimination and O absorption, but an agreement of the respiratory quotients was more difficult to obtain. It is believed that this was due more to the difficulty of detg. the O consumption in the bed calorimeter than to an actual difference in the character of the respiratory exchange. The 2 forms of the universal respiration app. gave good agreeing results. Comparison of the tension-equalizer unit with the Zuntz-Geppert and the Tissot app. and of the spirometer unit with the Zuntz-Geppert, Tissot and Douglas app. showed that the results of the respiratory exchange obtained with all of these app. were entirely comparable. A comparison of the respiratory exchange in mouth- and nose-breathing with the 2 forms of the universal respiration app. and with the Tissot app. and in mask- and nose-breathing with the spirometer unit showed that the respiratory exchange is practically identical with the various breathing appliances. A study of the Mueller valves in comparison with the spirometer unit and with the Tissot valves indicated that values obtained with the Mueller valves are reliable when subjects have become accustomed to their use. The addition of dead air space to the spirometer unit in amts. up to 225 cc. had no effect upon the respiratory exchange. The omission of the use of the automatic siphon counterpoise on the Tissot spirometer was also without effect upon the respiratory exchange. Tables of variations and probability curves for the various detns. made are given and discussed for

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nearly all of the comparisons. The publication concludes with a critical discussion of the sources of error, the advantages and disadvantages of the various app. and methods used, breathing appliances, valves, gas-analysis app., and the accuracy and interpretation of the results of the respiratory exchange of man. F. G. B.

Determination of acidity of urine. J. CLARENS. *Compt. rend.* 160, 814–7(1915).—A known amt. of 0.1 *N* HCl is added to a definite amt. of urine, which is then brought to boiling to remove CO_2, and rapidly cooled. The soln. is titrated with 0.1 *N* KOH or NaOH free from carbonates, using phenolphthalein as indicator. Subtract from the buret reading the number of cc. of HCl used. If the result is positive the soln. is acid; if negative, the soln. is alk. Care should be taken not to boil the soln. too long. Titration should be made in the cold. H. D.

Immunizing and curative value of antitetanic serum. G. TIZZONI AND P. PERRUCCI. *Compt. rend.* 160, 845–7(1915).—The value of the serum is determined as follows: Two rabbits weighing 1200–1500 g. each are injected intravenously with 0.5 cc. and 1.0 cc. of serum, resp. After 24 hrs., a fatal dose of strychnine (1 cc. = 0.6 mg. per kg.) is injected beneath the skin of the back. If the two rabbits survive, the serum is efficient and may be used, the preventive dose being 5 cc. and the curative dose 25 cc. If the rabbits die, the serum is rejected. H. D.

Typhoid toxin and production of a serum specific against typhoid fever. H. VINCENT. *Compt. rend.* 161, 220–3(1915).—A method for obtaining a very toxic typhoid culture, from which antitoxin may be prepd. H. D.

The action of normal and basic lead acetates on the sugars, with remarks on Rubner's test for dextrose and lactose. HAROLD ROGERSON. Guy's Hospital Med. School, London. *Biochem. J.* 9, 245–52(1915).—The results seem to indicate that "Rubner's test" for dextrose and lactose (*Z. anal. Chem.* 24, 447, 603(1885)) is also given by other common sugars—levulose, galactose, mannose, maltose, arabinose. Sucrose does not give the test. B. HOROWITZ.

The source of carbon monoxide in the air and its detection. LEO G. MEYER. Basel. *Arch. Hyg.* 84, 79–120(1915).—Three methods of detecting CO in the air are compared. The method of Vogel consists of mixing the suspected air with a dil. soln. of blood and, after the addition of a reducing substance (Stoke's soln.), testing the mixt. for characteristic absorption bands. By this method 0.12% CO was detected. This method sometimes fails because there are often certain gases produced in the combustion of some substances which act on the blood so as to prevent its reaction with CO. In the method of Welzel, dild. blood is exposed to the action of the suspected air and the amt. of color in a ppt. of protein produced by some substance as tannin shows the amt. of CO in the air. This method is sensitive to 0.0025%. In the method of Winkler, the CO is absorbed by a soln. of $CuCl_2$ in a nearly satd. soln. of NaCl. The soln. is then dild. and a layer of $PdCl_2$ is poured over it. A black ring indicates the presence of CO. A 4th test is with $PdCl_2$ paper, which, when moistened with distd. H_2O or CH_3COONa, will turn black in the presence of CO. The objection to this test is that NH_3, SO_2 and CS_2 will also give a positive test. The test is sensitive to CO from 0.5 to 0.05%, depending on the time the paper is exposed to the air being tested. The Deprex-Nicloux test depends on the liberation of free I from I_2O_5 in the presence of CO. This test is sensitive to 0.09%. M. believes that the test with Pd-paper is the best and uses it to show that CO is given off by such objects as charcoal burners, gas smoothing irons, gas ovens, open gas flames used for cooking, hot H_2O heaters, Dawson gas generators, and gasoline engines. JULIAN H. LEWIS.

A convenient form of apparatus for demonstration of osmotic pressure exerted by lipins. WM. J. GIES. Columbia Univ. *Biochem. Bull.* 2, 170–1(1912).—Immerse

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a 12 in. piece of Bunsen tubing in Et_2O until it has been swollen to its max. dimension. Close one end of the tube by inserting a piece of glass rod. Fill the tube with olive oil and tie a narrow glass tube about 10 ft. long (in 2 sections) into the open end. Immerse the tube in Et_2O in a tall narrow cylinder. The oil will rize in the tube almost immediately and continues rapidly until the liquid emerges from the open top.

A. P. LOTHROP.

A convenient method of preparing starch that swells rapidly in water. WM. J. GIES. Columbia Univ. *Biochem. Bull.* **2**, 172–3(1912).—Prepare a very thick starch paste by rapidly pouring a thick potato starch suspension through muslin into boiling H_2O while stirring vigorously. Rapidly cool the paste by immersing the vessel in ice H_2O and stirring the paste constantly. Pour the cold paste into a large excess of 95% alc., allow to settle and decant the supernatant alc. liquid. Treat with fresh portions of alc. until the mass is granular. Wash several times with Et_2O to remove the alc. and dry in a current of air from an elec. fan. Prepared in this way the starch is markedly hydrophylic and when placed in H_2O swells rapidly into bloated glassy forms.

A. P. LOTHROP.

A simple classroom experiment for demonstrating the production of acid by contracting muscle. E. N. HARVEY. Princeton Univ. *Biochem. Bull.* **2**, 464(1913).—The expt. is based on the fact that NH_4OH readily penetrates living tissues and hence may be used to neutralize the acid produced in muscle cells during functional activity. The skinned legs of a frog are stained in neutral red and one is elec. stimulated. Both legs are then placed in physiological salt soln. containing 0.02 *N* NH_4OH. The unstimulated muscles are immediately turned yellow while the stimulated muscles retain their red color. The expt. can be performed in a very short time, the color change is striking and the reaction is a delicate one. The acid produced by 10 induced shocks may easily be detected under proper conditions. A. P. LOTHROP.

Studies of intracellular chemistry: a differential stain for mucins and mucoids. LOUIS BERMAN AND WM. J. GIES. Columbia Univ. *Biochem. Bull.* **2**, 547–8(1913).—From a mixt. of 5 parts of 0.25% soln. of safranin and 3 parts of 0.25% soln. of methyl green, mucins and mucoids select the methyl green and are colored green. Samples of 15 other representative proteins are stained red by such a mixt. Glucothionic acids from various glucoproteins are also stained green. One part of tendon mucoid mixed with 100 parts of collagen or edestin can easily be detected by this differential staining. A. P. LOTHROP.

The preparation of modified collodion membranes for use in dialysis experiments. FRANK R. ELDER. Columbia Univ. *Biochem. Bull.* **2**, 549(1913).—Satisfactory membranes were prepd. from uniform mixts. of 1 part of olive oil and 4 parts of collodion soln. Bags made from mixts. of 1 part of oil and 9 of collodion were impermeable to Cl^-, sucrose and peptone in dialysis expts. of a week's duration. A. P. L.

A further effort to prepare a colorless biuret reagent. A. W. THOMAS. Columbia Univ. *Biochem. Bull.* **2**, 556–8(1913).—A temporarily colorless reagent can be prepared by dissolving about 0.1 g. of K cuprocyanide in 50 cc. of 10% NaOH soln. Fehling alk. tartrate soln. may also be used. It remains colorless only a few hrs. Several common organic salts of Cu were tried but without success. A. P. LOTHROP.

Clinical studies of the Russo test. MAX KAHN. New York. *Biochem. Bull.* **3**, 306(1914).—Russo recommends the following test for diagnosing typhoid fever: to 5 cc. of freshly voided urine add 2–3 drops of a 1% aq. soln. of methylene blue; an emerald green color signifies a positive result; a trace of blue is negative. In tests on 269 patients, positive results were obtained in cases of tuberculosis, malaria, typhus, septic infections, biliary disease, advanced carcinoma and meningitis, as well as in

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typhoid cases. Children suffering from empyema invariably reacted positively to the test. In typhoid fever the Russo test is positive several days before the Ehrlich diazo reaction and lasts a few days after the diazo reaction disappears. A. P. L.

Acetone as a precipitant of albumin. MARK J. GOTTLIEB. Columbia Univ. *Biochem. Bull.* 3, 458(1914).—A concn. of Me_2CO above 50% is necessary for the complete pptn. of protein from a 10% soln. of egg white in 5% NaCl soln. The protein is denatured by the Me_2CO in any concn. and the ppt. is entirely insol. in H_2O or salt soln. A. P. LOTHROP.

The solubility of urea in ether, and of uric acid in alcohol and in ether. Ross A. GORTNER. Carnegie Inst. *Biochem. Bull.* 3, 468–9(1914).—Inasmuch as nearly all tissue analyses are carried out by extn. methods, a very appreciable amt. of urea may be dissolved by Et_2O, although the solubility of urea in Et_2O is not much greater than 0.4 mg. in 100 cc. Uric acid is insol. in Et_2O but very slightly sol. in abs. alc. (0.08 mg. per 100 cc.). This, however, is sufficient to dissolve 26 mg. in a 48 hr. extn. "Insoluble" in the biochemical sense should mean no appreciable solubility after a 48-hr. extn. in an extn. app. A. P. LOTHROP.

The removal of acetoacetic acid from urine in creatine and creatinine determinations. G. GRAHAM AND E. P. POULTON. *Proc. Physiol. Soc.; J. Physiol.* 48, lv(1914). —The distn. method of removing acetoacetic acid from urine may be employed without danger of destroying creatine provided the temp. does not exceed 60 to 65°. When considerable amts. of acetoacetic acid are present it is better to adopt a modification of Greenwald's Et_2O extn. method, *viz.:* remove P_2O_5 and add 2 to 5 cc. 40% $FeCl_3$ soln. per 200 cc. urine. Filter and acidify the filtrate with 0.5 vol. *N* HCl. Ext. with Et_2O for 12 hrs. at 50°. Sep. the Et_2O layer and remove the last traces of Et_2O by an air blast. Det. creatine and creatinine in the usual way. J. F. LYMAN.

A new way of staining cells in the cerebrospinal fluid. B. LEMCHEN. *Med. Record* 88, 443(1915).—The stain is prepared by mixing a 2% soln. of benzidine in glacial AcOH with an equal vol. of H_2O_2. By this method the erythrocytes are stained blue, polymorphonuclear lymphocytes yellow with a blue nucleus, and the large lymphocytes dark blue at the periphery. It is possible to differentiate the stained cells under the low power of the microscope. A. H. RAHE.

Color reactions of trioses and methylglyoxal. CARL NEUBERG. Kaiser Wilhelm Inst. *Biochem. Z.* 71, 150–7(1915).—*dl-Glyceric aldehyde.* The orcinol test is positive; the white condensation product becomes green upon heating, and gives a green soln. with $C_5H_{11}OH$. If the soln. is very dil. and is heated several min. the color may be violet to brown. If the solid aldehyde is dissolved in glacial AcOH, orcinol and concd. HCl added, a red soln. results; this later gives a dark brown ppt. Phloroglucinol gives a white condensation product which becomes bluish gray or brown upon long heating. Neither product is sol. in $C_5H_{11}OH$. The solid aldehyde in AcOH-HCl gives a red-brown soln. with an adsorption band in the green. Heated with 12% HCl and resorcinol as usual for 1 min., no color develops. After 3 min. there is a turbidity, from which a yellow compd. can be extd. with $C_5H_{11}OH$. With Na nitroprusside, glyceric aldehyde does not give a characteristic reaction. *Dihydroxyacetone.* With orcinol and HCl, a green color is formed, which, if shaken before a ppt. forms, gives a green soln. with $C_5H_{11}OH$ with typical orcinol bands. If the soln. is boiled 3 min., a greenish white ppt. forms; this is sol. in $C_5H_{11}OH$, shows a total absorption in the blue but no typical bands. With solid dihydroxyacetone and concd. HCl in AcOH a blue-green soln. with typical bands results. A 1% soln. with phloroglucinol gives a violet liquid, with absorption bands in the yellow. Upon long warming a ppt. is formed, sol. in $C_5H_{11}OH$ with red-brown color, the bands of which do not change in 10 hrs.

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With solid material a brick- or bluish red soln. results, showing a strong band in the green, present after 24 hrs. With resorcinol a yellow-red dye is obtained, sol. in $C_5H_{11}OH$ with garnet red color, showing bands in the greenish blue. The solid gives a raspberry colored soln. With Na nitroprusside, a brownish or yellowish red color is obtained, changing to olive green upon adding AcOH. *Methylglyoxal.* Orcinol gives a yellowish white ppt., sol. in $C_5H_{11}OH$ but showing no absorption bands. The same is true of phloroglucinol. With resorcinol a yellow soln. is obtained, giving a yellowish red ext. without sharp absorption bands. With high concns., a red color is obtained, giving a rose-colored $C_5H_{11}OH$ ext. with bands in the green. With Na nitroprusside a deep red soln. is obtained, becoming violet upon addition of AcOH. With the acetal, a deep violet-red soln. is obtained, becoming violet-blue when AcOH is added. By using 2 g. of glyceric aldehyde or dihydroxyacetone traces of furfural may be obtained, but methylglyoxal gives none. Glyceric aldehyde may be distinguished from dihydroxyacetone in that the former does not give a positive phloroglucinol reaction. Dihydroxyacetone also reacts typically with orcinol. Methylglyoxal may be detected by the marked positive test with Na nitroprusside. C. J. West.

Estimation of lactic acid in presence of pyruvic acid. Ludwig Czapski. Kaiser Wilhelm Inst. *Biochem. Z.* 71, 167–8(1915).—In using the method of Embden and Oppenheimer (*C. A.* 8, 1793) for the sepn. of lactic and pyruvic acids, it is necessary to use at least twice the amt. of $NaHSO_3$ corresponding to the expected amt. of pyruvic acid, to prevent extn. of some of the pyruvic acid by the Et_2O. Zn pyruvate, $Zn(C_3H_3O_3)_2.3H_2O$, crystallizes easily and separates under the same conditions as lactic acid. It differs from it only by 2 H. C. J. West.

Simple test for small amounts of glycerol as well as of alcohols and acids of the carbohydrate series. John A. Mandel and Carl Neuberg. Kaiser Wilhelm Inst. *Biochem. Z.* 71, 214–8(1915).—Two to three cc. of the soln. contg. glycerol are oxidized with 3 drops *N* NaOCl, heating a few min., 3 drops NaOCl again added, the mixt. heated 1 min., 3 drops HCl added and the mixt. again heated to destroy any excess NaOCl, and the orcinol test applied, a violet or greenish blue color being obtained. The amyl alc. ext. is bluish green. Glycerophosphoric acid gives the same reaction. The following alcohols and acids give the test: erythritol, adonitol, *l*-arabitol, *d*-mannitol, *d*-sorbitol, dulcitol, *d*-Ca gluconate, *d*-mannonic acid lactone, *d*-Cd galactonate, *d*-glucosaminic acid, *d*-glucose, *d*-mannose and *d*-galactose. C. J. West.

A new method for quantitatively estimating indican in urine. Adolf Jolles. Vienna. *Z. physiol. Chem.* 94, 79–103(1915); cf. *C. A.* 9, 1308, 2883.—The indican content of urine may be detd. by the method previously given if the urine is treated with 0.1 its vol. of $Pb(OAc)_2$, then with the corresponding vol. of alc. thymol soln., and concd. HCl containing $FeCl_3$, and extd. with $CHCl_3$. Detns. were made with a number of normal and pathol. urines. A comparison of different methods shows that Boumas's method gives high results while those of Ellinger and Immabuchi give low results, differing about 23 and 11% from those obtained by the new method. C. J. West.

A micro-Kjeldahl apparatus. Max Morse. Trinity College. *Biochem. Bull.* 2, 457–8(1913).—An app. is described which is a combination of that designed by Pregl and the fume absorber of Folin and Denis (*C. A.* 7, 1117) or Sy (*C. A.* 7, 1429). In conjunction with the micro-amino-N app. of Van Slyke, the app. is especially adapted for work with small amts. of protein. A. P. Lothrop.

C. BACTERIOLOGY.

ERNEST D. CLARK.

A bacterial test for plant food accessories (auximones). W. B. Bottomley. *Proc. Roy. Soc. London* (*B*) 89, 102(1915).—B. gives the name auximones to those org.

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substances necessary in small amts. for the growth of plants and in some respects analogous to Suzuki's "oryzanins" or Funk's "vitamines." Hitherto the only means of demonstrating the presence of auximones was by their action on the higher plants. B. gives a bacteriological test in which liquid cultures of nitrifying organisms are employed, the culture used in the test being a subculture from 10 g. garden soil, 100 cc. tap water, 0.1 g. $(NH_4)_2SO_4$, 0.1 g. K_2HPO_4 and 0.2 g. $MgCO_3$. When the auximones (obtained from bacterized peat by extn. with H_2O and pptn. with phosphotungstic acid) are added and the culture incubated at 26°, a scum forms in 24 to 36 hrs. and no nitrates are observed in the soln., while without the auximone no scum forms and nitrification proceeds normally. No scum was observed after 4 days with equiv. solns. of sucrose, maltose, asparagine, peptone, leucine, tyrosine and hordein. The test is specific for auximones. By the above method their presence is demonstrated in rotted manure, root nodules of leguminous plants, etc. The organisms which form the scum require no org. C for their growth, in this respect resembling N, S and Fe bacteria. The plant auximones differ from the vitamines in that they are not destroyed by heating. H. W. BANKS, 3RD.

Putrefaction. F. BORDAS AND S. BRUÈRE. *Compt. rend.* 161, 34–6(1915); cf. following abstr.—A dog, buried in manure, was reduced to a skeleton within 8 days. The influence of temp., medium of burial, germs, etc., on the time of decompn., was investigated. Three fetuses, buried one above the other, in a mixt. of straw and peat and sprinkled with a soln. consisting of 450 cc. urine, 1540 cc. water, and 10 cc. purine soln., were found to be disintegrated at the end of 19 days. H. D.

Putrefaction. F. BORDAS AND S. BRUÈRE. *Compt. rend.* 160, 847–9(1915); cf. preceding abstr.—Putrefaction takes place with the aid of external enzymes and proceeds most rapidly at 25°. H. D.

Iron bacteria. E. C. HARDER. *Science* 42, 310–1(1915).—H. discusses various forms of iron bacteria, their occurrence and possible relationship to the formation of iron ore deposits. H. D.

Soil organic matter as a culture medium for Azotobacter. FLORENCE A. MOCKERIDGE. King's College, London. *Biochem. J.* 9, 272–83(1915).—The N-fixing organisms (of which *Azotobacter* is a type) flourish upon specialized non-nitrogenous organic compds. It has been assumed that carbohydrate in some form is essential for the nutrition of *Azotobacter*. M.'s object was to discover to what extent the organism could utilize the non-nitrogenous organic compds. found in the cell. *Procedure:* The culture medium employed was that used by Bottomley (cf. *C. A.* 6, 3106). For the detn. of the N-fixing power of the organism upon each substance, 50 cc. portions of the medium, containing 1% of the nutrient, were placed in each of six 300 cc. Erlenmeyer flasks and sterilized in the autoclave at 140°. Where organic acids were employed, sufficient $CaCO_3$ to neutralize them was added to each flask, and in the case of volatile organic substances these were not added to the medium until the flasks containing the inorganic salts in soln. had cooled down after sterilization. Each flask was provided with a sand slope consisting of 50 g. of pure sterile sand and was then inoculated with 1 cc. of a uniform suspension in distd. water of *Azotobacter* from a mannitol-agar plate. Two flasks of each series were again sterilized to serve as controls and the whole series was incubated at 26° until all trace of the organic substance originally supplied had disappeared from the medium, when the contents of each flask were analyzed for N (Kjeldahl method). Humates, polysaccharides, sugars, alcohols, vegetable acids (other than aliphatic), fatty acids, esters, glucosides and various benzene derivs. were used. The results obtained indicate the wide range available. Any ordinary fertile soil contains abundant food material for the growth of *Azotobacter*.

B. HOROWITZ.

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A biochemical study of certain bacterial pigments. I. J. KLIGLER. Columbia Univ. *Biochem. Bull.* 3, 458–60(1914).—White, yellow and orange pigments produced by 6 organisms were studied. Optimum growth conditions are also the most favorable for color formation. The pigments are sol. in alc., Et_2O and $CHCl_3$. They are apparently not true lipochromes although they give a characteristic lipochrome reaction when treated with concd. H_2SO_4. They are all decolorized by concd. acids and by oxidizing and reducing agents, but their behavior to alkalies is highly specific. Attempts to isolate the pigments from the other organic substances were not successful; they were studied in a partially pure state. A. P. LOTHROP.

An oxalic acid-producing Penicillium. JAMES N. CURRIE AND CHARLES THOM. U. S. Dept. Agr., Bur. of Animal Ind. *J. Biol. Chem.* 22, 287–93(1915).—A new oxalic acid-producing fungus, *Penicillium oxalicum*, is described. It is a less rapid producer of $(CO_2H)_2$ than *Aspergillus niger*. When $CaCO_3$ is added to the media the mold grows poorly but the yield of $(CO_2H)_2$ is greatly increased and may reach 40% of the sugar employed. The $(CO_2H)_2$ is not an end-product but reaches a max. in 8–12 days and then diminishes in amt. It produces the acid readily from various sources of C such as cane sugar, lactose, potato starch and peptone. This organism is the first *Penicillium* recorded which forms $(CO_2H)_2$ as the chief product of its metabolism. A. P. LOTHROP.

Comparative rate at which fluorescent and non-fluorescent bacteria are killed by ultraviolet light. W. E. BURGE AND A. J. NEILL. *Am. J. Physiol.* 38, 399–403(1915).—Fluorescent bacteria (non-spore formers) are much more resistent to ultraviolet light than non-fluorescent organisms. It is assumed that fluorescent bacteria are able to convert the short wave lengths into longer wave lengths and thus escape their protein-coagulating power. J. F. LYMAN.

Chemistry of higher fungi. XI. Lactarius scrobiculatus Scop., Hydnum ferrugineum Fr., Hydnum imbricatum L. and Polyporus applanatus Wallr. JULIUS ZELLNER. *Monatsh.* 36, 611–32(1915); cf. *C. A.* 7, 2775.—*Lactarius scrobiculatus* Scop. Petroleum ether ext. is 11–12% air-dried material. The crude fat has an acid no. of 120.72, 122.98, sapon. no. of 181.75, 182.43. The principal part of the fatty acids is $C_{18}H_{36}O_2$. A little glycerol, H_3PO_4 and choline were found. The unsapon. part gave an ergosterol-like compd., sinters 145°, m. 155°. The Et_2O ext. is small and consists of resins. The alc. ext. is brown, containing a phlobaphene-like compd., sol. in hot H_2O and slightly sol. in dil. alc. and alkali, mannitol, a little grape sugar and probably choline. The hot H_2O ext. contains a substance resembling viscosin, from which, after hydrolysis with dil. H_2SO_4, glucose and mannose were isolated. *Hydnum ferrugineum* Fr. The petroleum ether ext. is 5 to 5.5%. Sapon no. of fat 189.35, acid no. 104.28, unsapon. matter 15.25%. This consists largely of liquid fatty acids. The unsapon. part consisted of ergosterol-like compds. From the Et_2O ext. (6–7%), a mixt. of fumaric and benzoic acids was extd. with H_2O; the principal part is a deep brown resin, easily sapond. and giving small amts. of benzoic acid. The alc. ext. contains mannitol, grape sugar, choline, which are extd. by H_2O. The H_2O-insol. part (10% of the fungus) is a violet-brown powder. Extd. with AcOEt, thelephoric acid is left as a residue (Zopf, *Die Pilze*, p. 126, 154). The AcOEt ext. consists of two *benzoic esters of hydnoresinotannol*, sepd. by fractional crystn. from alc. The smaller amt., (*A*), $C_{28}H_{26}O_6$, is the more insol., microscopic rhombic crystals, m. 272° (decomp.), insol. in cold alkalies, gives no reaction with $FeCl_3$. Heated above its m. p., it gives off benzoic acid (also obtained upon sapon.). The other product of sapon. is an amorphous, reddish yellow compound, *resinotannol*, easily sol. in alc. and acetone, and in hot H_2O. The alc. soln. is pptd. by alc. KOH, $Pb(OAc)_2$, but not by Cu, Ca or Ba acetates. $FeCl_3$ gives a dark olive brown color. The red aq. soln. is

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pptd. by $FeCl_3$, forming dark flakes. Heated with HNO_3 it yields picric acid. (*A*) *acetate*, m. 276°. (*B*) *ester*, $C_{36}H_{20}O_7$ or $C_{36}H_{28}O_7$, m. 251–2° (decomp.). $FeCl_3$ gives a dark yellow soln. The cryst. K salt is sol. in H_2O. It is optically inactive. *Acetate*, needles and prisms, m. 182°; it contains 2 Ac groups. *Nitro derivative*, fine, pale yellow needles, m. 227° (decomp.). The H_2O ext. contains thelephoric acid, pholobaphene and a gum-like carbohydrate. *Hydnum imbricatum* L. The fat has a sapon. no. of 170, acid no. of 106, I no. 92, unsapon. matter 9.04%. It contains lecithin and ergosterol. The Et_2O ext. contains a resin. The alc. ext. contains pholobaphene-like substances and mannitol. *Polyporus applanatus* Wallr. The fat has a sapon. no. of 137, acid no. 53.5, unsapon. matter 32.26%. The Et_2O ext. contains a brownish red resin and ergosterol-like compds. The alc. ext. contains a pholobaphene, ocher-colored powder, the analysis of which gives the formula $(C_4H_3O)_x$, and mannitol. C. J. West.

Change in the alcohol and aldehyde content of yeast upon standing and during autolysis. Carl Neuberg and Erwin Schwenk. Kaiser Wilhelm Inst. *Biochem. Z.* 71, 126–32(1915).—Perfectly fresh yeast does not contain aldehyde; upon standing, there develops a small aldehyde content, which can be washed out by using cond. H_2O and centrifuging. Yeast, kept in a closed, nearly full vessel, shows an increased aldehyde and alc. content. It is not probable that this aldehyde is formed by the oxidation of the alc. by the air. In the hydrolysis of dry or fresh yeast in H_2O satd. with CO_2, there is also an increase in the amt. of EtOH and MeCHO. No relation was found between the amts. of the 2 substances formed. C. J. West.

Deposition of sulfur during the chalk-sulfur epoch (Bargazli-Petrucci) 8.

D. BOTANY.

CARL L. ALSBERG.

The function of chlorophyll. A. J. Ewart. *Proc. Roy. Soc. London* (*B*) 89, 1 (1915).—The chlorophyll (*A*) was prepared by Willstätter's method, slightly modified. Methods for preparing pure xanthophyll (*B*) and carotin (*C*) from grass are also given. No peroxides are produced during the photoöxidation of *A*, *B*, or *C*, but these substances when exposed to light in the presence of an abundant supply of O, may act as oxidases not only toward themselves but toward substances such as HI, litmus, guaiacum, etc. Hence arizes the iodoxidase reaction. *A* and *B* decompose during photoöxidation into (*a*) wax-like substances and hexose sugars and (*b*) CH_2O. In dry air free from CO_2 more CH_2O and less sugar are formed, while the bleached residue weighs much less than originally. In moist air more sugar is formed, and the residue may weigh nearly as much as the original solid. C oxidizes more rapidly than *A* or *B* and yields a little CH_2O and a large amt. of solid, possibly phytyl or phytosterol. The reaction $A + CO_2 = B +$ colorless waxy solid, takes place in presence of water and is accelerated by sunlight. A portion of the O_2 set free may oxidize the *B* to CH_2O, sugar and phytyl. Some special means must exist in the chloroplastid of liberating the remaining O_2 without oxidizing *A*, and the latter may be protected from photoöxidation by C. The reductase reaction of Mg may also be of importance. There is some evidence that *A* may be built up not only from ethyl chlorophylide and phytyl alcohol, but also from *B* and the products from the photoöxidation of *A*. Assimilation of CO_2 involves a complex series of chem. changes which are at least partly reversible. *A* and *B* play a direct chem. part, and light acts as accelerator and possibly as a directive agent. H. W. Banks, 3rd.

Oxidation and reduction with plant chromogens. J. Wolff and N. Rouchelmann. *Compt. rend.* 160, 716–8(1915); cf. *C. A.* 8, 3318.—Under the oxidizing influence of laccase the chromogens of plants give rise to a pigment which may be reduced by HI with the liberation of I. W. and R. hold that this is due to direct action of the

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laccase and not to a system of peroxide peroxidases in the plants and give exptl. data in support of their contention. H. D.

Role of chlorophyll. P. Mazé. *Compt. rend.* 160, 739–42(1915).—Chlorophyll plays a purely physical rôle. There is no evidence pointing to the view that chlorophyll has any immediate action in the chem. transformations accompanying the assimilation of CO_2. H. D.

Distribution of invertin in tissues of beets. H. Colin. *Compt. rend.* 160, 777–9 (1915).—A discussion of the distribution of invertin in the tissues of beets at different stages of vegetation. H. D.

Enzymes of cacao. H. C. Brill. *Philippine J. Sci.* 10, 123–33(1915).—The pulp surrounding the cacao bean contains a greater number of enzymes than the fresh bean itself. The former contains casease, protease, oxidase, raffinase, and invertase; the latter gives reactions for casease, raffinase, and very strongly for oxidase. The fermented bean contains casease, protease, oxidase, diastase, raffinase, and invertase. H. D.

The tinctorial properties of pigments produced from thymol by ammonium hydroxide. Wm. J. Gies. Columbia Univ. *Biochem. Bull.* 2, 171–2, 293(1912–3).—NH_4OH produces from thymol a blue pigment which is extd. by Et_2O. In Et_2O soln. the pigment is red. After evapn. of the Et_2O, a purplish oily product remains which yields a purplish soln. in alc., becoming blue when made alk. Filter paper, soaked in the blue alc. soln. and dried at room temp., assumes a bright red color as the alc. evaps.; the moist red paper treated with alc. a second time becomes bright green. A. P. Lothrop.

The action of ammonia on phenols. B. Horowitz. Columbia Univ. *Biochem. Bull.* 3, 303–4(1914).—The action of 10% NH_4OH soln. on the following phenols has been studied: phenol, *m*-cresol, thymol, α-naphthol, tyrosine, resorcinol, orcinol, vanillin, phloroglucinol and pyrogallol. All developed colors sooner or later. The colors were different for each phenol, but none approached the blue that thymol yielded (cf. Gies, preceding abstract). Extn. of the alk. liquids with Et_2O gave colorless layers for all except naphthol (dirty brown) and thymol which was red or reddish violet. The reaction is, thus, a distinguishing test for thymol. The rate of intensity of color formation bears a direct relationship to the number of OH groups in the phenol. A. P. Lothrop.

A study of the carbohydrates of the prickly pear and its fruits. R. F. Hare. Columbia Univ. *Biochem. Bull.* 2, 173–5(1912).—The juice of the ripe fruit contains 1.57% of pentosans and a trace of galactan; after pptn. with Pb acetate it gives a reaction for pentose but not for galactose; fructose and glucose are present in considerable amts. The dried mucilage, sepd. by pptn. with alc. from a 2% soln., contains 15% galactan, 31% pentosan and 12% ash. It is impossible to free it from impurities. A 1.5% soln. has no effect on polarized light before or after acid hydrolysis. Heating with 1.25% H_2SO_4 produces a sugar having properties similar to arabinose; its osazone m. about 160°. A 95% alc. ext. of the dried stems contains a sugar with sp. rotations made on 3 sep. solns. of —5.6°, —8.25°, and —7.1°. Its osazone has properties similar to those of glucosazone, indicating the presence of glucose and fructose in this ext. A 60% alc. ext. contains a substance apparently intermediate in character between mucilage and sugars; it does not reduce Fehling soln. before hydrolysis but is readily hydrolyzed by dil. acids. More concd. alc. ppts. the material as a flocculent mass which readily gives a non-mucilaginous soln. in H_2O. The coloring matter can be made into a marketable product, of value for coloring certain foods, by pptg. the mucilage and gums with alc. and pptg. the pigment from the filtrate with Me_2CO.

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The pigment is evidently a glucoside as it yields a glucose-like sugar on hydrolysis. A. P. LOTHROP.

The comparative enzyme content of green and variegated leaves of Tradescantia. CARL A. SCHWARZE. Columbia Univ. *Biochem. Bull.* 2, 183–4(1912).—Juices expressed from the green and yellow leaves of *Tradescantia* both contain oxidase and peroxidase, the yellow juice containing more of the enzymes. The juice from yellow leaves gives a negative Fehling test; that from the green portions, a positive test. The juice from the green leaves on drying yields a glossy, dark green residue, that from the yellow leaves, a brown cryst. mass. A. P. LOTHROP.

The occurrence of a toxin in juice expressed from the bread mold, Rhizopus nigricans (Mucor stolonifer). A. F. BLAKESLEE AND ROSS A. GORTNER. Carnegie Inst. *Biochem. Bull.* 2, 542–4(1913).—The mycelium and aerial filaments of *Rhizopus nigricans* contains a H_2O-sol. substance which is very toxic for rabbits. An ext. of 45 mg. of the dry fungus, injected intravenously, is sufficient to kill a 1.35 kg. rabbit in 2 min. When the toxin from a greater quantity than 45 mg. is injected, the animal is often dead before the needle can be withdrawn. A sub-lethal dose causes great lethargy, lasting for 48 hrs. or more. The activity of the toxin is not diminished by peptic digestion for 3 hrs. nor affected by heating the aq. soln. to boiling for 10 min. Apparently, therefore, it is not a toxalbumin. A. P. LOTHROP.

The problem of the assimilation of carbon dioxide by plants. P. N. RAIKOW. Univ. Sofia. *Chem. Ztg.* 39, 657–9(1915).—R. discusses briefly the discrepancies between the theory and observed facts in Baeyer's hypothesis, and presents the following "oxonium hypothesis," based on the formation of oxonium compds. and tautomerism: chlorophyll is known to be an ester-like compd. containing at least a tribasic acid, and is so closely related to hemoglobin that their dissimilar physiol. properties must be due solely to a difference in certain radicals in the mols. Investigations of oxonium compds. have so clearly shown the ability of O to become tetravalent that it is reasonable to suppose that under favorable conditions every O-containing organic compd. forms oxonium compds., which may be formed from chlorophyll (Ch), CO_2 and H_2O, with the formula $Ch{:}O{:}C{:}O{:}O\begin{smallmatrix}H\\H\end{smallmatrix}$, which may be considered a deriv. of H_2O_2. Under the influence of sunlight a mol. rearrangement occurs, giving $Ch{:}O{-}\overset{H}{\overset{|}{C}}{:}O{:}O\overset{H}{|}$, which, under further action of light, splits into $Ch{:}O{-}\overset{H}{\overset{|}{C}}\overset{H}{|}$ + O:O, an endothermic reaction which only proceeds above a certain minimum light intensity and only in direct light rays. The compd. formed by splitting off the O_2 is Ch isoformaldehyde, which may at once decompose into Ch and isoformaldehyde, the latter changing to formaldehyde or a polymer; or, the Ch isoformaldehyde may first polymerize before splitting up; or, the regeneration of the Ch takes place during the polymerization, which is most probable. R. concludes that half the O comes from CO_2 and half from H_2O. Graphic formulas are given to show the condensation of isoformaldehyde into pentoses, hexoses, etc., and a short bibliography is included. Cf. *C. A.* 5, 1795, 2265, 3466; 7, 812, 3606; 8, 2179. J. H. MOORE.

Urease in legume nodules and other plant parts. M. S. BENJAMIN. Hawkesbury Agr. College. *J. Proc. Roy. Soc. N. S. Wales* 49, 78–80(1915).—The presence of a urea-splitting enzyme was shown in a number of plants of the legume family; its occurrence is not general, however, as its absence in other members of the same family is also shown. Other plant parts such as ovules and pollen and tubercles and bulbs

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of certain plants contain urease as do some algae and lichens. B. concludes that the detection of urease in parts of plants in which symbiosis occurs as well as in other parts in which active metabolic changes are in progress suggests that some correlation may exist between its presence and those processes of elaboration and interchange of nutritive material which are constantly occurring in the living plant. R. L. SIBLEY.

E. NUTRITION.

PHILIP B. HAWK.

NORMAL.

Energy transformations during horizontal walking. FRANCIS G. BENEDICT AND H. MURSCHHAUSER. *Carnegie Inst. Pub.* No. 231, 100 pp., 7 figs.(1915).—The main object of this research was to study the increase in metabolism due to walking on a level at increasing speeds. A complete historical review is given of all previous research in which the gaseous metabolism during horizontal walking has been studied, including a large summary table in which the results of 20 different investigations are recorded and compared on the basis of the movement of 1 kg. over 1 m. of level path, *i. e.*, one horizontal kilogrammeter. With the universal respiration app. and a special type of treadmill designed and constructed by E. H. Metcalf, a study was made in the fall of 1913 and the spring of 1914 of the gaseous metabolism of 2 subjects while walking on a level. Detns. were made of the CO_2 production, the O consumption and the distance walked by the subject; records of the respiration-rate were obtained automatically by a special tambour arrangement; a few records of pulse-rate were obtained with the Bock-Thoma oscillograph and the Einthoven string galvanometer; the exact number of steps taken was recorded automatically by a step-counter; and finally, the height to which the body was raised during walking was measured by a work-adder wheel with a scheme by which each upward and downward movement of the body was recorded upon a rotating kymograph drum. To establish a base-line for comparison with the metabolism during walking preliminary expts. were made with the subject (1) standing with body relaxed without external support; (2) leaning against a support at the back; (3) leaning on a staff; and (4) standing with muscles tense in the position of "attention." A few expts. were also made with the subject standing and swinging the arms from side to side as in a fast walk, and with the subject sitting and lying. In the walking expts. the subject walked at a very slow speed, a medium speed, or a very fast speed, and in a few expts. actually ran, thus giving data for comparing the work of forward progression while the subject was walking with that while he was running. A study was also made of the effect on metabolism of fatigue due to long-continued walking. Usually both the standing expts. and the walking expts. were made during the post-absorptive state and when the subject had food in the stomach, but the influence of both heavy and light meals upon the metabolism was also studied. In a few expts. the diet was controlled, a special protein, carbohydrate or fat diet being supplied. In the observations both with and without food the heat per horizontal kilogrammeter was practically independent of the taking of food; an increase in the energy per unit was noted as the speed increased and a considerable less energy per unit when the subject was running as compared with that when he was walking. The report concludes with an analysis of the mechanics of locomotion.

F. G. B.

ABNORMAL.

A preliminary study of the resistance of fasting dogs to hemorrhage. PAUL E. HOWE AND WM. J. GIES. Columbia Univ. *Biochem. Bull.* 2, 468–9, 551–2(1913).—After an av. loss of 21% of the normal body wt. as a result of fasting, blood equal to an av. of 3.3% of the body wt. at the time of operation was removed from 10 surviving dogs without causing serious symptoms. In 5 animals receiving only H_2O daily for

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10–13 days, blood amounting to 3.54–5.38% was removed. In 3 animals receiving a standard diet minus the meat for 33 days, 4.5–5.1% of the blood was removed.
A. P. LOTHROP.

Nitrogen metabolism of a man when ingesting successively a non-protein and a normal diet after a seven-day fast. F. D. ZEMAN, J. KOHN AND P. E. HOWE. *Proc. Am. Physiol. Soc.; Am. J. Physiol.* 36, 162(1915).—Detn. of urinary N compds. was made during a fast, a 4-day recuperation period on a non-protein diet and a 4-day final period on a normal diet. An increase of body wt. occurred during the non-protein period accompanied by a loss of N, while the reverse was noted in the final period.
J. F. LYMAN.

F. PHYSIOLOGY.

ANDREW HUNTER.

The level of blood sugar in the dog. P. A. SHAFFER AND R. S. HUBBARD. Washington Univ. *Proc. Soc. Biol. Chem.; J. Biol. Chem.* 20, xxxiv(1915); cf. *C. A.* 8, 3815.—The high values for blood sugar obtained after etherization appear to be in large part due to a mild degree of asphyxia. If forced respiration is employed, the concn. of blood sugar rizes only slightly.
I. GREENWALD.

Extractive substance of muscular tissue. XVII. One of the causes of the shortage of nitrogen. I. A. SMORODINTZEV. *J. Russ. Phys. Chem. Soc.* 47, 1272–4(1915).—In working up meat exts. by Gulevich's method (Thierfelder, Hoppe-Seyler's "Handbuch d. phys.-u. path.-chem. Analyse," 1909, 758), the ppt. obtained after neutralization with $Ba(OH)_2$ is usually rejected as supposedly not containing N. S. shows that this ppt. contains hypoxanthine. This accounts for the frequently observed shortage of N in the different fractions of meat exts. The hypoxanthine is supposed to be adsorbed by the $BaSO_4$ produced in the analysis. **XVIII. Double compound of creatinine with silver nitrate.** *Ibid* 1275–9.—Under the influence of $AgNO_3$ in acid soln. creatine changes to creatinine, which then unites with the $AgNO_3$ to give Neubauer's double compd. $C_4H_7N_3O.AgNO_3$ (*Ann.* 119, 45). This compd. is therefore liable to be met with in working up meat exts. if $AgNO_3$ be used at some stage of the analysis.
H. M. GORDIN.

Nature of the hepatic fatty infiltration in late pregnancy and early lactation. V. H. MOTTRAM. *Proc. Soc. Biol. Chem.; J. Biol. Chem.* 20, xxxi(1915).—Rabbits were used. "Control animals have a fatty acid percentage of fresh liver ranging from 2.36 to 3.19, with a mean of 2.62. Animals treated in the same way for the same time or longer, at full term or a day or two post-partum, show a range from 2.67 to 6.05, with a mean of 4.43. Taking other criteria, *e. g.*, total liver fat or total liver fat divided by a function of the body wt., the result is the same; at or about the time of parturition there is an increase in the total fat in the liver. Histological results parallel this even in small percentage differences. Argument from I values shows that the liver is infiltrated with fatty acid."
I. GREENWALD.

Studies on the vasomotor center. Effects of intravenous infusion of normal saline solution. J. D. PILCHER AND T. SOLLMANN. *Am. J. Physiol.* 35, 70–2(1914).—In normal animals intravenous infusion of saline soln. (20 cc. to 40 cc. 0.9% NaCl per kg.) slightly stimulates the vasomotor center or leaves it unchanged. Occasionally a maintained rise in blood pressure is produced with considerable stimulation of the center. This is probably accounted for by a hypersensitive center. Level of blood pressure previous to making the infusion has no effect on vasomotor response provided the original pressure is 60 to 170 mm. Hg.
J. F. LYMAN.

Influence of extract of the posterior lobe of the hypophysis upon the secretion of saliva. G. O. SOLEM AND P. A. LOMMEN. *Am. J. Physiol.* 38, 339–49(1915).—

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Pituitrin injected intravenously caused a decrease in the flow of saliva from the submaxillary gland. Simultaneous stimulation of the chorda tympani or the administration of pilocarpine or epinephrine increased the blood flow in the gland but not markedly the flow of saliva. The effect of pituitrin probably is due to inhibition of the secretory nerves and also to vasoconstriction. J. F. LYMAN.

Influence of the vagus nerve on the gaseous metabolism of the kidney. R. G. PEARCE AND E. P. CARTER. *Am. J. Physiol.* 38, 350–5(1915).—Stimulation of the vagus below the level of the heart after section of the splanchnic nerve had no effect on O consumption by the kidney. This is evidence against the existence of secretory fibers in the vagus. J. F. LYMAN.

Cutaneous reaction. ANGELO DE DOMINICIS. *Boll. chim. farm.* 54, 68–70(1915). —D. has further studied the cutaneous reaction according to which a slight skin lesion (removal of a superficial stratum without injury of the papillary layer and without effusion of blood) presents an alk. reaction to red litmus paper during life and an amphoteric reaction to red and blue litmus paper a short time after death (before the reaction becomes exclusively acid). The appearance of the acid reaction does not occur simultaneously in all parts of the body after death. Expts. with rabbits showed that this reaction is given by the skin of the abdomen in $^1/_2$–$1^1/_2$ hrs. after cessation of respiration; the red coloration of the blue litmus is very faint when it first appears and is not discernible when the paper becomes dry. The alk. reaction of the skin of the abdomen disappears in 4–10 hrs. after cessation of respiration. The temp. has a remarkable effect on the behavior of the cutaneous reaction; reduced temp. favors the early appearance of the acid reaction. This early appearance of the red coloration of blue litmus paper is accompanied by a prolongation of the original alk. reaction, although the latter becomes quite faint. In cases of rapid poisoning by CO a faint acid reaction was presented by the skin of the abdomen in 1 hr. after death; the alk. reaction disappeared after approx. 7 hrs. H. S. PAINE.

Gastro-intestinal studies. X. Investigation of the gastric residuum in over one hundred normal cases. C. C. FOWLER, M. E. REHFUSS AND P. B. HAWK. Jefferson Med. Coll. *J. Am. Med. Assoc.* 65, 1021–5(1915); cf. *C. A.* 8, 3069, 3571.—Expts. were made upon subjects receiving no water between the evening meal and 8 o'clock A.M. the next day, when the stomach residuum was completely removed by means of a Rehfuss tube. The liquid so obtained was measured, filtered through a moistened filter, the first few drops of the filtrate being discarded, and the total acid, free acid, pepsin, trypsin, cryoscopic index, and sp. gr. detd. The quantity of liquid found varied from 23 to 160 cc., av. 52.14 cc. In 67 cases noted, 43% gave a colorless, and 57% a yellow or green residuum. In 102 cases total acidity averaged 29.9 in terms of 0.1 *N* NaOH, the highest being 77.6 and the lowest 2.4. Free acid averaged 18.5; ranging from 65.8 to 0. In 72 cases the cryoscopic index averaged —0.470, the extremes being —0.816 and —0.298. Sp. gr. detd. by pycnometer in 69 cases averaged 1.0056, ranging from 1.010 to 1.0036. Pepsin concn. measured by the Mett method in 53 cases, averaged $(2.8)^2$, the limits being $(5.0)^2$ to $(0.7)^2$. Trypsin in 26 cases averaged 9.1 units, 12 cases giving 16 units, and 2 cases showing no evidence of trypsin. Microscopic examn. showed no gross food residues; occasionally vegetable débris was found, but never meat fibers. Leucocytes were generally present and occasionally swallowed material from the throat with bacteria. The residuum in every case had all the qualities of a physiologically active secretion. The results confirm previous findings by the authors, that "the accepted limit of the normal residuum of the empty stomach as 20 cc. is false." Expts. show that the gastric glands are never inactive as these secretions appear in the absence of normal stimuli. From the standpoint of osmotic pressure there is a constant tendency toward the formation of a secretion in the stomach. Both

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colorless and bile colored residuums may be found, and the two may occur in the same individual; the colored residuums appear more frequently with high acidity, showing greater regurgitation in that condition. Total and free acidity vary directly with one another. Free acidity was rarely found until the total acidity exceeded 10. A definite relationship appears between the amt. of pepsin and total acidity for low acid values; this disappears when the acidity becomes high. Trypsin appears to be inversely proportional to free acidity. This article contains 7 charts and many references. L. W. RIGGS.

Coagulation of blood; herudinized blood. V. S. SADIKOV AND A. A. LOZINSKII. *Russ. Vrach* 14, No. 17(1915); *J. Am. Med. Assoc.* 65, 1149.—Sheep blood herudinized by adding a product of the glands of the mouth of a leech and dild. several times with normal salt soln. does not coagulate and shows no signs of hemolysis. A 0.5 per 1000 soln. of ricin or abrin acts in a similar way. Complete hemolysis occurs, however, after the addition of a 0.5 per 1000 soln. of solanin, and a little later coagulation takes place. Rabbit blood behaves differently; 0.5% ricin causes coagulation but no hemolysis; 0.5 per 1000 abrin tardy coagulation; while solanin in a 0.5 per 1000 soln. causes immediate coagulation and hemolysis. The blood of the guinea pig, cat, and man coagulates under a 0.5% soln. of ricin, or 0.5 per 1000 soln. of abrin, but is not affected by solanin. Pigeon blood coagulates only from the 0.5% soln. of ricin. A 10% soln. of NaCl does not change the blood of sheep, rabbit, guinea pig or man but transforms the blood of the pigeon into a jelly-like mass. The response of blood of different animals to these reagents may serve for its differentiation. L. W. RIGGS.

The comparative physiology of creatine and creatinine. MAX MORSE. Woods Hole, Mass. *Biochem. Bull.* 2, 546–7(1913).—No creatine or creatinine is demonstrable in the fresh muscles of the tail of the larva of the common frog or in the excretions by the usual color reactions. The absorption of the tail involving the disappearance of over a g. of tissue within 12 hrs. does not concern N elimination in excess of the normal for non-metamorphosing frogs. A. P. LOTHROP.

G. PATHOLOGY.

H. GIDEON WELLS.

Immunization tests with glanders vaccine. J. R. MOHLER AND A. EICHHORN. Bur. Animal Ind., U. S. Dept. Agr., *Bull.* 70, 1–13(1914).—Various attempts have been made to obtain immunity in horses against glanders, but without success. These expts. were designed to test the value of a vaccine consisting of a suspension of dried glanders bacilli prepd. in the lab. of the New York City Board of Health. The expts. were made on guinea pigs and horses, and in the latter case the blood was subjected to agglutination and complement-fixation tests. The results obtained show that this method of immunization is unsatisfactory. E. J. C.

Preliminary communication on the influence upon rat tumors of serum containing enzymes specific to those tumors. E. ABDERHALDEN. *Med. Klin.* 10, 188–9; *Chem. Zentr.* 1915, I, 1179.—If the juice pressed out of a rat sarcoma is injected into the blood stream of a rabbit or dog, the serum of the animal shows, after twenty-four hours, the ability to break down cooked tumor tissue. If this serum is injected into a rat having such a tumor, the tumor gradually disappears. H. D.

Partial synthesis of antitoxins. I. OSTROMISLENSKII AND D. I. PETROV. *J. Russ. Phys. Chem. Soc.* 46, 1340, proceedings (1914).—The globulins of horse serum can be converted into any antitoxin (diphtheria, tetanus, etc.) without the aid of animals (*in vitro*). Hence the synthesis of the antitoxins is waiting only for that of albumin. Details are promised for the near future. H. M. GORDIN.

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The more recent developments in the study of anaphylactic phenomena. HANS ZINSSER. Columbia Univ. *Arch. Intern. Med.* 16, 223–56(1915). I. GREENWALD.

Potassium poisoning in nephritis. WILSON G. SMILLIE. Boston. *Arch. Intern. Med.* 16, 330–9(1915).—Rabbits with U nephritis and with 100 mg. of non-protein N per 100 cc. of blood die suddenly after the ingestion of 1 g. KCl, which is innocuous to normal rabbits. Patients with chronic nephritis may be acutely poisoned by doses of KCl (10 g.) that are without effect upon normal individuals. The effect is thought to be due to a failure of excretion of the KCl, which thereby reaches a toxic concn. in the blood. I. GREENWALD.

The diminished power of the nephritic kidney for eliminating uric acid as exemplified by the use of atophan. MORRIS S. FINE AND ARTHUR F. CHACE. *Arch. Intern. Med.* 16, 430–6(1915).—In nephritis the effect of atophan on the uric acid concn. in the blood is much diminished and, in severe cases, may be entirely lacking. I. GREENWALD.

Further observations on the presence of iodine in tuberculous tissues and in the thyroid gland. PAUL A. LEWIS AND ROBERT B. KRAUSS. Univ. Penna. *J. Biol. Chem.* 22, 159–63(1915); cf. *C. A.* 8, 3325.—Using the method of Krauss (*C. A.* 9, 2913) it was found that the tuberculous tissue of rabbits may contain I, independent of the intentional administration of substances containing I. The thyroid gland of rabbits may at times be free from any appreciable amt. of I. I. GREENWALD.

The influence of sodium carbonate upon glucosuria, hyperglucemia, and the respiratory metabolism of depancreatized dogs. B. KRAMER AND J. R. MURLIN. Cornell Univ. Med. College. *Proc. Soc. Biol. Chem.; J. Biol. Chem.* 20, xxvii(1915); cf. *C. A.* 7, 3357.—The administration of Na_2CO_3 to the depancreatized dog lowers the ratio of glucose to N in the urine as well as the glucose output per hr. The glucose is not retained as such in the blood, nor deposited as glycogen in the liver or muscles, nor is it condensed to other substances yielding glucose on hydrolysis with acids. It is not excreted into the alimentary tract nor does lactic acid appear in the urine. Study of the respiratory quotient indicated that very little, if any, of the retained glucose was oxidized. I. GREENWALD.

The reciprocal relations of virulent and attenuated cultures in active immunization. PHILLIP B. HADLEY. Kingston, R. I. *Centr. Bakt. Parasitenk., I Abt.* 76, 442–56 (1915).—Among 17 virulent strains of the fowl bacterium tested for their resistance-producing power toward highly virulent cultures, only 1 (culture 52) was found which produced any resistance whatever; this culture, upon subcutaneous inoculation, invariably gave perfect immunity against the most virulent culture possessed (culture 48). When tested against 5 other virulent strains, it produced protection against 3 regularly and irregularly against the other 2. There was complete immunity against all, however, when inoculation with culture 52 was followed with inoculation with culture 48. These results show for the first time complete control over infection in rabbits with probably any virulent strain of the fowl cholera bacterium. JULIAN H. LEWIS.

Specific enzymes for the different constituents of bacterial cells. F. HUTYRA AND R. MANNIGER. Budapest. *Centr. Bakt. Parasitenk., I Abt.* 76, 486–562(1915).—Killed anthrax bacilli of the non-capsulated variety produces in the immunized rabbit, enzymes which digest both this variety and the capsulated form. Killed anthrax bacilli of the capsulated variety produce enzymes which also digest both kinds and, in addition, the pure isolated capsular substance. The serum produced by either variety digests anthracoid bacilli weakly. Immunization with the pure capsular substance produces enzymes which digest this substance and the capsulated variety of anthrax bacilli only. Immunization with living anthrax bacilli gave results similar

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to those with dead bacilli, except with the former the non-capsulated form produces enzymes which digest both varieties. The difference is probably due to the fact that the living non-capsulated forms produce a capsule in the body. The expts. indicate the phylogenetic relationship of the anthracoid and anthrax bacilli. J. H. L.

Pneumococcus immunity. J. TILLGREN. Stockholm. *Centr. Bakt. Parasitenk., I Abt. Orig.* 76, 537–48(1915).—It is found that the leucocytes of rabbits, guinea pigs, and dogs contain a substance that is bactericidal for maximal virulent pneumococci. If the leucocytes or exts. of them are injected subcutaneously simultaneously with virulent pneumococci, they have no effect on the production of an infection. The leucocytes are not active if phagocytosis is precluded. The bactericidal substance is potent only within the leucocyte. JULIAN H. LEWIS.

Separation of the antibody fractions in hog cholera serum. FREDERICK EBERSON. Ames, Ia. *J. Infect. Dis.* 17, 339–50(1915).—Hog cholera serum can be split up by chem. means into an actively protecting globulin fraction and into an inactive albumin fraction. Pptn. of serum proteins by means of $(NH_4)_2SO_4$ is practically possible for hog cholera serum. The bulk of the serum, being inactive albumin, may be dispensed with. Concn. for practical purposes may be effected (1) by pptg. the euglobulin from the dild. serum, by means of a 33% satd. soln. of $(NH_4)_2SO_4$, filtering, and after dialyzing the ppt. in running H_2O, dissolving it in the smallest vol. NaCl soln.; (2) by pptg. the serum (dild. 10–15 times) by $^1/_2$ satn. with $(NH_4)_2SO_4$ (satd. soln.), filtering, dialyzing the ppt., and treating as in (1). Since the globulin constituents are protective, this method would prove more economical and simpler. Euglobulin represents 20–21% of the total serum protein, pseudoglobulin 0.5%, and albumin about 80%.
JULIAN H. LEWIS.

Toxins and the side-chain theory. ARTHUR F. COCA. New York. *J. Infect. Dis.* 17, 351–60(1915).—C. believes that Ehrlich's application of the principle of Weigert to explain the reaction of tissues to antigen stimulation can no longer stand. If a tissue be exposed at intervals to the influence of an irritant, that tissue becomes increasingly resistant to the irritant and the cell multiplication, which is the index of reaction on the part of the tissue, becomes less and less, while tissues that are exposed at intervals to antigenic stimulation exhibit at first more and more sensitiveness to that stimulation, as is shown by the increased production of the specific antibodies up to a certain height, after which, instead of a power of resistance or hyposensitiveness developing against the antigenic stimulation, the response may continue unabated for an indefinite period, subject only to the condition of the general health, which may be affected by the injections of the antigen. C. believes that a more plausible analogy is found in the response of digestive glands to specific chem. stimulation offered by foodstuffs than in the response of tissues to injurious influences. It is thought that the establishing of the fermentative nature of the toxins would give support to his theory. C. believes this to have been done at least with cobra venom. This substance contains a lipase which splits lecithin into oleic acid and the lecithin rest—"desoleolecithin." This lipase does not follow the criteria established for enzymes.
JULIAN H. LEWIS.

A rapid and efficient method of producing hemolytic amboceptor against sheep corpuscles. ARTHUR F. COCA. New York. *J. Infect. Dis.* 17, 361–8(1915).—After a long series of expts. C. adopts the following procedure for the production in rabbits of a hemolytic serum of high titer against sheep corpuscles. Two intravenous injections of 1 cc., or at the most 2 cc., each of washed sheep corpuscles should be given at an interval of not less than 4 days to 3 rabbits. At the end of 5 days after the 2nd injection at least 1 of the rabbits will almost always yield a strongly hemolytic serum, the potency of which will be stable. If it is desired not to kill the animal, almost as much blood

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usually can be obtained by bleeding from the ear vein on 2 successive days (6th or 7th day after 2nd injection) as by bleeding to death. The potency of the serum obtained from the 2nd bleeding is as high as that obtained from the 1st bleeding. The rabbits should not be used again for the production of amboceptor against sheep corpuscles. The same results are obtained with the use of sheep corpuscles. JULIAN H. LEWIS.

The effect on antibody production of the removal of various organs. LUDVIG HEKTOEN. Chicago. *J. Infect. Dis.* 17, 409–14(1915).—In the dog, complete removal of the small intestine or of the thyroid does not interfere with the development of agglutinin and opsonin for rat corpuscles after intravenous injection of rat blood. Pancreatectomy, complicated by intestinal intersusception and by rabies, resulted in a diminution in the amts. of antibodies that accumulated in the blood. Simultaneous removal of the spleen and pancreas appears to have about the same depressing effect on antibody production in dogs as removal of the spleen only. Removal of the small intestine and ligation of the mesenteric artery after injection of rat blood in dogs may be followed by a longer latent period than after the injection of antigen in normal dogs. Adrenalectomy at the height of the antibody curve in dogs does not change the antibody content of the blood serum. In rats, the removal of about $^1/_2$ of the liver appears to have no effect on the development of lysin for sheep corpuscles. The results recorded indicate that the mechanisms for the fabrication of antibodies are quite secure from certain disturbances, and they are in no way contradictory of the current view that these mechanisms are located in the blood-forming organs.

JULIAN H. LEWIS.

The influence of the X-ray on the production of antibodies. LUDVIG HEKTOEN. Chicago. *J. Infect. Dis.* 17, 415–22(1915).—Repeated exposures of white rats to X-rays immediately after the injection of sheep blood do not interfere in any noteworthy degree with the production of lysin when the exposures, though sufficient to reduce the number of leucocytes in the blood, have no definitely detrimental effect on the general health of the animals. When the exposures are commenced some days before the injection of the sheep blood and continued in such manner that the number of leucocytes is greatly reduced for 15–20 days after the injection of sheep blood, the formation of lysin is restrained to a marked degree. This may be accomplished without any appreciable effect on the general health. In such animals the spleen, lymphatic tissues, and thymus are greatly reduced in vol. and the bone-marrow changed. In the blood, the granular leucocytes are increased relatively and the total number of leucocytes is much below normal. A single prolonged and eventually fatal exposure to X-rays immediately before the injection of sheep blood may prevent any formation of lysin for the next 8 days or so, or lysin may be produced after a longer period of latency than in the control animals. The results harmonize with the view that antibodies are produced in the spleen, lymphatic tissues, and marrow, as these structures suffer most directly from the action of X-rays. The results indicate also that 1 reason why the lymphocyte appears to be an important agent of defense in tuberculosis and other conditions may be its power to form antibodies. In view of the destructive action of Ra on leucocytes and blood-making organs, it is altogether likely that it will be found to have the same general effect on the production of antibodies as do X-rays.

JULIAN H. LEWIS.

The toxicity of guinea pig urine and its relation to anaphylaxis. ALLAN C. EUSTIS. Tulane Univ. *Biochem. Bull.* 2, 158–9(1912).—Guinea pig urine, injected intravenously into guinea pigs, gives rise to symptoms resembling anaphylactic shock. 1.5 cc. is a lethal dose for a 300 g. pig. The urine contains an excess of indican and of putrefactive amines and there is evidently some relation between the occurrence of the latter and anaphylactic shock.

A. P. LOTHROP.

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Action of β-imidazolylethylamine and the relation to asthma and anaphylaxis. ALLAN C. EUSTIS. Tulane Univ. *Biochem. Bull.* 2, 159–60(1912).—Intravenous injections of 0.5 mg. in guinea pigs cause death in 6 min. with symptoms of anaphylactic shock. Subcutaneous and intraperitoneal injections are much less toxic, and, in some instances, are entirely negative, suggesting that the tissues are able to utilize the compd. Red meats predispose to asthmatic attacks and, as β-imidazolylethylamine is produced in the putrefaction of histidine and hemoglobin yields a large % of histidine on decompn., it is possible that β-imidazolylethylamine causes asthma. Unlike clinical asthma, exptl. asthma produced by this compd. is not relieved by injections of epinephrine. A. P. LOTHROP.

The chemical constitution of renal calculi. MAX KAHN. Columbia Univ. *Biochem. Bull.* 2, 178(1912).—Sixteen stones of nephric origin were analyzed. Most of the stones were composed mainly of Ca salts. All contained uric acid or urates but none were composed wholly of urates. The shape, color and consistency of a stone are not criteria of its chem. compn. Three gouty tophi were tested for urates by the murexide test. A negative response was obtained in each case, showing that not all gouty deposits are composed of uric acid salts. A. P. LOTHROP.

Biochemical reasons why free purgation is necessary in combating acidosis of diabetes; results of clinico-chemical studies. ALLAN C. EUSTIS. Tulane Univ. *Biochem. Bull.* 2, 285–6(1913).—When *p*-$C_6H_4OHEtNH$ is perfused through the liver, it yields $PhCH_2CO_2H$. As the amine is a product of intestinal putrefaction of tyrosine, and assuming that some such cleavage takes place with other aromatic amines of intestinal putrefaction, their formation should be markedly hindered by free purgation, with a consequent reduction of acidemia. In 16 cases observed by E., there was a drop in NH_3, Me_2CO and indican when free purgation was instituted in conjunction with a low protein diet. A. P. LOTHROP.

Urinary catalase in health and disease. MAX KAHN AND CHARLES J. BRIM. New York. *Biochem. Bull.* 3, 307(1914).—Traces of catalase are found in freshly voided normal urine. The catalase content is high in urines that react positively for blood, bile and Me_2CO, and in cases of lymphosarcoma, Hodgkin's disease, typhoid fever and general septic infections. In severe diabetes, patients with acidosis eliminate largely increased amts.; diabetics with no acetonuria show no variation from the normal. In cases of cancer no variation from the normal is observed except where the liver is involved and where the disease is considerably advanced. A. P. LOTHROP.

Chemical studies of the relations of oral microörganisms to dental caries. I. The importance of a reëxamination and an extension of the available knowledge pertaining to the kinds and chemical influences of oral bacteria in their relation to the teeth. WM. J. GIES. Columbia Univ. *J. Allied Dental Socs.* 10, 137–40(1915). **II. A biochemical study and differentiation of oral bacteria with special reference to dental caries. 1.** I. J. KLIGLER. Columbia Univ. *Ibid* 141–66.—Historical review. **III. A biochemical study and differentiation of oral bacteria with special reference to dental caries. 2.** I. J. KLIGLER. *Ibid* 282–330.—Primary caries may, from the enormous count and from the changed character of the prevailing flora, be considered a specific infection in which a limited number of types (perhaps 3) are concerned. The significant facts are (*a*) marked increase in the acidific bacteria, some of which are capable of producing an acidity of 8% *N* acid, and (*b*) the accompanying numerical increase in the long and short thread forms, which can readily attach themselves in the form of compact colonies to any surface. This type is relatively abundant in carious teeth. The relation this organism may bear to the concn. on a small area of a large number of active acid-producing rods is suggestive. Decay of the pulp is a process that is different from decay of enamel and dentin. Associated

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with this process there are (*a*) relatively low bacterial count, (*b*) a drop in the relative number of cocci, similar to that found in primary decay but differing from the latter also in showing a disappearance of the thread forms, and (*c*) the presence in all cases of anaerobic putrefying organisms. The acidific type persists in practically the same abundance as in the initial stages of decay. The authors describe about 25 types of bacteria which have been isolated from deposits on normal and decayed teeth.

A. P. LOTHROP.

The hexone bases of malignant tumors. R. A. KOCHER. Univ. Calif. *J. Biol. Chem.* **22**, 295–303(1915).—The amts. of hexone bases in malignant tumors are much greater than in various normal adult tissues. The yields of arginine, lysine and histidine obtained on the hydrolysis of tumors are generally over 100% greater than those obtained in hydrolyzed normal somatic tissue. The amts. are also greater than those found in any isolated protein except protamines and histones. No tests for protamines and histones in the fresh tumor tissue could be obtained. "These results in conjunction with those of Osborne and Mendel may explain the action of lysine in promoting normal growth on the ground that this diamino-acid, which cannot be synthesized in the body, is an inherent requirement of the newly forming protein and is embodied in the structures of the latter molecule." It is probable that arginine and histidine play a similar rôle. Investigations are in progress to det. whether the occurrence of a high % of hexone bases peculiar to malignant tumors or such an increase will be found in normal rapidly growing tissue. A. P. LOTHROP.

Some observations on the selective activity of the human kidney. OTTO FOLIN AND W. DENIS. Mass. General Hosp. and Harvard Med. School. *J. Biol. Chem.* **22**, 321–6(1915).—The authors have been able to collect separately, quantitatively and simultaneously, urine secreted by each kidney from patients operated on for malignant growths in the bladder. Analyses of such urines show "that the power of the kidney to excrete nitrogenous substances is more easily or more frequently damaged than is the salt excretion by moderate hydronephrosis and pyelitis. The phosphate excretion does not correspond closely to the chloride excretion and the excretion of creatinine and that of uric acid also do not vary together, the creatinine excretion resembling more nearly the level of the total N excretion. The figures obtained rather agree with the view that the excretion of urine by the kidney can be subdivided into an unknown number of different more or less independent excretions." No broad generalization is warranted on account of the limited number of cases available for study.

A. P. LOTHROP.

The relation between chloride retention, edema and acidosis. M. H. FISCHER. Cincinnati, O. *Kolloid-Z.* **16**, 106–9(1915); see *C. A.* **9**, 821. H. I. MATTILL.

Ferment action. XXIII. Mechanism of anaphylactic shock. JAMES W. JOBLING, WILLIAM PETERSEN AND A. A. EPSTEIN. Vanderbilt Univ. *J. Exp. Med.* **22**, 401–17(1915).—The serum enzymes are practically unaltered by a primary injection of foreign protein. During the course of the sensitization the injection of the antigen is followed by the mobilization of a non-specific protease which increases in rapidity and intensity as the max. period of sensitization is reached. Acute shock is accompanied by (1) the instantaneous mobilization of a large amt. of non-specific protease, (2) a decrease in antienzyme, (3) an increase in non-coagulable N of the serum, (4) an increase in amino acids and (5) a primary decrease in serum proteoses. Later there is a progressive increase in the non-coagulable N, in proteoses and in serum lipase. The acute intoxication is brought about by the cleavage of serum proteins and proteases into the peptone stage by a non-specific protease. The specific elements lie in the rapid mobilization of this enzyme and the colloidal serum changes which bring about the change in antienzyme titer. G. M. MEYER.

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Osteohemochromatosis. O. R. TEUTSCHLAENDER. Düsseldorf. *Arch. path. anat.* 217, 393(1914); *Zentr. Biochem. Biophys.* 17, 654(1915).—The affection known as pseudo-ochronosis of the bones is only the most apparent partial manifestation of a general hemochromatosis the cause of which is not known, but the occasion for which is found in an extended decompn. of erythrocytes, as is indicated by the regeneratory appearance of numerous erythroblasts in the bone marrow and the deposition of pigment in various organs (bones, spleen, lymph glands, liver and kidneys). The pigment usually gives a positive Fe reaction; the spectrum is that of acid hematoporphyrin or alk. hematin, the differences being explained by the age of the pigment deposit. Resorption apparently takes place in addition to deposition of pigment and it is assumed that a portion of the hemochrome is again employed in erythrocyte formation, while another portion is excreted by the kidneys, as is indicated by the detection of pigment in the kidney epithelia. H. S. PAINE.

Relation between cholesterol and the Wassermann reaction. CARBONE AND NIZZI. *Biochim. terap. sper.* 4, 306–16; *Zentr. Biochem. Biophys.* 17, 662(1915); cf. *C. A.* 8, 2568.—C. and N. attempted to ascertain whether the serum cholesterol is contained *in toto* or in part in the globulin fraction (or euglobulin) of sera which react positively to the Wassermann reaction and also whether this cholesterol is present in peculiar (chem. or physical) form. Nine sera were investigated, 5 of which were obtained from individuals uffering from progressive paralysis, while the other 4 were obtained from persons afflicted with various other diseases. Each serum was treated with an equal portion of satd. aq. $(NH_4)_2SO_4$ soln. and sepd. into 2 (albumin and globulin) fractions. An ext. was obtained from each of the 2 fractions and the Liebermann reaction for cholesterol was applied to each ext. These expts. led to inconst. results; it appeared, however, that, after treatment with $(NH_4)_2SO_4$, the cholesterol of the serum was retained in part in both the globulin and the albumin fractions. In the case of the 5 sera from paralytic individuals the alc. wash H_2O from the globulin contained cholesterol in 4 instances, while this result was not obtained in the case of the Wassermann-negative sera from individuals suffering from other diseases. H. S. P.

Intestinal absorption of albumin in the newborn and in infants with intestinal affections and its applicability as a method for the testing of function. RUDOLF LAWATSCHEK. Prague. *Prager med. Woch.* 39, 185–9(1914); *Zentr. Biochem. Biophys.* 17, 433(1914).—In order to ascertain the fate of egg albumen, the urine of children was investigated by means of the precipitin method. The reaction was positive; absorption of albumen had, therefore, occurred. Absorption of heterogeneous albumin continued until the 10th day after birth; this reaction of the urine ceased with increase in age, although it was observed in older infants in cases of serious intestinal affections. The values observed for the newborn were often exceeded in cases of acute enteritis and exacerbations of chronic processes; L., therefore, concludes that the permeability of the gastrointestinal canal for heterogeneous albumin is an index of the severity of affections of intestinal origin. The nucleoalbuminuria of infants depends on the absorption of unmodified colostrum albumins. H. S. PAINE.

Excretion of urobilinogen. E. SIEBER. Univ. Prague. *Sborník lékarsky* 15, 1–72(1914); *Zentr. Biochem. Biophys.* 16, 845–6(1914).—S. presents tabulated data which show the destructive action of sunlight and light from an elec. lamp on urobilinogen; the intensity of the action increases toward the short wave end of the spectrum. S. further discusses the relation of urinary acidity and atm. O to urobilinogen and reports the results of extn. expts. with $CHCl_3$, AmOH, AcOEt, Et_2O, C_6H_6 and ligroin. In connection with the controversy regarding the presence of urobilinogen in normal urine S. calls attention to the fact that the urine of the same individual may at certain times contain no urobilinogen, while at other times considerable amts. may be present;

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the amt. of urobilinogen is, therefore, of most importance. The modification of the original Ehrlich procedure according to which 0.5 cc. of the Ehrlich reagent is added to 10 cc. urine and the mixt. shaken with 1 cc. $CHCl_3$ is to be recommended; on the basis of this reaction S. has devized a quant. titration method with NaOH, suitable precautions being observed that the urobilinogen is accurately extd. by the $CHCl_3$ (spectroscopic investigation, detection of fluorescence of urobilin, etc.). Hemoglobin is to be regarded as the source of urobilinogen (urobilin). The spleen, and next the intestine, is the principal seat of the formation of urobilinogen; the latter passes with the venous blood to the liver where it is normally in large part transformed into bilirubin. Vascular engorgement in the abdominal organs (especially the liver) is to be regarded as the cause of urobilinuria in disturbances of the circulation. Urobilinogen is not observed after seizure in angina pectoris, but may be detected in abundant amt. in the period of recovery (explanation of this behavior may be found in the occurrence of vascular spasm and consequent insufficient resorption in the intestine or insufficient passage from the liver to the blood). The urobilinuria which ensues in pneumonia is dependent upon the accumulation of CO_2 in the blood and upon circulatory disturbances, etc., during the period of recovery from decompn. of erythrocytes (various suggestions are made regarding the evaluation of the behavior of urobilin in this disease). In pleuritis the extent of urobilinuria is, among other things, connected with the amt. of exudate and the rapidity of increase of the latter. Similar observations were made regarding urobilin excretion in pulmonary tuberculosis and various infectious diseases. S. discusses the occurrence of urobilinuria (as a result of circulatory disturbances) in pregnancy; the large amt. of urobilinogen resulting from accumulation of CO_2 before birth may be regarded as an index of approaching delivery. Urobilinogen may also be detected in the milk. S. finally discusses urobilinogen excretion in affections of the gastrointestinal tract; no definite relation was established between urobilinogen excretion and permeability of the intestinal tract. Inflammation of the gall-bladder is usually accompanied by the occurrence of large amts. of urobilinogen; the latter is not usually increased in appendicitis. S. discusses the repeated appearance and disappearance of urobilinogenuria in catarrhal jaundice with reference to a possible explanation therefor. The behavior of urobilinogen in cirrhosis of the liver and inflammation of the gall-bladder is discussed. H. S. PAINE.

Physio-chemical investigations of sputum with especial reference to sputum in pneumonia. A. BERTOLLINI. Genoa. *Clin. med. ital.* 52, 3–21; *Zentr. Biochem. Biophys.* 17, 438(1914).—Individual investigations of sputa failed to reveal any pronounced physical or chem. characteristics which were sp. for various diseases. Compilation of the data of numerous investigations yielded curves which were characteristic, however, of the principal disease aspects, such as the curves for simple bronchitis, pneumonia, broncho-pneumonia and bronchitis with asthma. The crisis in pneumonia is not accompanied by a corresponding sputum crisis. H. S. PAINE.

Paroxysmal hemoglobinuria. E. E. ROBERTS. *Brit. Med. J.* 1915, II, 398–9.—During hemoglobinuria just before a rigor, the serum was found to contain hemolysins. After the hemoglobinuria subsided these could not be detected.

A. H. RAHE.

The significance of alveolar carbon dioxide determinations in the treatment and prognosis of diabetes. E. P. POULTON. *Brit. Med. J.* 1915, II, 392–8.—Fridericia's method for alveolar CO_2 (*C. A.* 8, 1980, 3679; 9, 1349) is the most satisfactory for clinical purposes. A description of the app. and directions for its use are given. The use of the tensimeter permits of the division of acidosis into 2 classes: (1) mild cases, in which the alveolar CO_2 falls within normal limits and (2) severe cases, in which the alveolar CO_2 is less than normal. A. H. RAHE.

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Rocky mountain spotted fever treated with adrenal secretion. M. H. SMITH. *Med. Record* 88, 568(1915).—In 3 cases of spotted fever the course of the infection was shortened by the administration of adrenaline (glandular ext.). The favorable action of quinine in this disease may be due to the stimulating action of this drug on the adrenals. A. H. RAHE.

Production of bilirubin outside the liver. A. A. H. VAN DEN BERGH AND J. SNAPPER. *Nederlandsch. Tijdschrift Geneeskunde*, July 10, 1915; *J. Am. Med. Assoc.* 65, 913; cf. *C. A.* 9, 1491, 1939.—In a case of progressive anemia in which the spleen was removed, improvement followed, but nearly a year later there was some destruction of blood corpuscles with pronounced bilirubinemia, showing that the spleen was not the only organ involved in the destruction of the blood. Dogs treated with phenylhydrazine developed progressive pernicious anemia with the spleen enlarged and much more bilirubin in the splenic vein than in the splenic artery. L. W. RIGGS.

Enzymes in the blood and urine in nephritis. A. LORENZINI. *Policlinico* 22, No. 32(1915); *J. Am. Med. Assoc.* 65, 1067.—L.'s long study of this subject treats each of the enzymes in turn, discussing their proportions in the blood and urine of nephritics and of healthy controls. Pathologic albuminuria is associated with marked reduction of the lipase in the urine, while the proportion in the blood is abnormally high. L. W. RIGGS.

Examination of the duodenal contents and its clinical value. A. M. LICHTENDORFF. *Russ. Vratch* 14, Nos. 16–20(1915); *J. Am. Med. Assoc.* 65, 1226.—Samples were taken with an Einhorn tube and bucket. The juice is light in color, sometimes brownish, and transparent. Turbidity shows an admixt. of stomach juice or white corpuscles. Reaction is alk., neutral or sometimes acid from stomach fluid. In obstructive icterus no bile was found. All 3 enzymes of the pancreas were present. Microscopic findings are reported. The clinical value of these exams. appears to be insignificant. L. W. RIGGS.

Creatinine test of diseased kidney functioning in the pregnant. M. ORLOVIUS. *Z. Geburtshufle Gyn.* 77, No. 2(1915); *J. Am. Med. Assoc.* 65, 1065.—The creatinine content of the urine is detd. every 6th hr. during one day. The next day the patient takes 1.5 g. of creatinine in 200 cc. sweetened water and the urine is tested for creatinine at 6-hr. intervals. Data are given for 3 non-pregnant healthy controls, 10 healthy pregnant controls, and 6 pregnant women with symptoms of serious kidney trouble. O. extols the harmlessness and various advantages of this test. L. W. RIGGS.

Pancreas secretion. MAX EINHORN. New York. *Berl. klin. Wochschr.* 52, 844–8(1915).—Valuable information as to the condition of the pancreas can be obtained by measuring the pancreatic enzymes, amylopsin, steapsin and trypsin, in the duodenal contents. These are measured with the use of small tubes filled with a mixt. of agar and carbohydrate, fat, or hemoglobin. In this paper the strength of these enzymes in normal duodenal contents is detd. and then variations are detd. in a series of gastric, hepatic, and pancreatic disorders. JULIAN H. LEWIS.

The enzymic power of duodenal contents as a means of diagnosis of the functional activity of the pancreas. BURRILL B. CROHN. New York. *Biochem. Bull.* 2, 454–5 (1913).—An Einhorn duodenal pump is swallowed at night and in the morning, 2 hrs. after drinking 200 cc. of milk, the contents of the duodenum are aspirated. Quant. detns. are made of the amts. of amylase, lipase and trypsin present. Marked variations in the amts. of enzymes are found in various pathological conditions.
A. P. LOTHROP.

Research on gastric hyperacidity. S. G. MINTZ. *Russ. Vrach* 14, No. 14(1915); *J. Am. Med. Assoc.* 65, 1067–8.—The beef ext. test breakfast of Mintz (cf. *J. Am.*

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Med. Assoc. 58, 447(1912)) is regarded as greatly superior to others in use. This bouillon is homogeneous and stimulates the glands of the stomach to their max. activity independently of psychic factors, while it permits exact estn. of the abs. and relative acidity and of the amts. of the gastric juice secreted. With this test meal M. demonstrated that the stomach possesses the faculty of keeping the abs. acidity at the same level. With a derangement of the mechanism which regulates this leveling process, gastric acidity may rize to a high figure. With the Boas-Ewald test meal the increased acidity may be due to such derangement, or to an increase in gastric or motor functioning of the stomach. L. W. RIGGS.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

The effect of certain drugs on the respiration and gaseous metabolism in normal human subjects. HAROLD L. HIGGINS AND JAMES H. MEANS. *J. Pharmacol.* 7, 1–30(1915).—The names of the authors of this paper are incorrect in *C. A.* 9, 2670. E. J. C.

Action of colloidal gold: cardiac effects of undissolved metal particles. H. BUSQUET. *Compt. rend.* 160, 817–20(1915); cf. *C. A.* 9, 1940.—Colloidal gold when injected into a dog or rabbit could not be recovered in appreciable amounts in the urine, feces, or serum. A dose of 5 mg. per kg. of gold in soln. proved instantly fatal; colloidal gold in a similar dose exercized no harmful action. It is manifestly impossible that the cardiac action produced by colloidal gold is due to a gradual soln. of the gold. H. D.

Comparison of different epinephrine compounds and their homologs, according to their effect on the arterial pressure of a dog which had received atropine. M. TIFFENEAU. *Compt. rend.* 161, 36–9(1915).—Const. effects are produced by the same dose of an epinephrine compd. Proportionate effects are obtained if the dose be increased or decreased. There is a const. relative proportionality of these effects. Levorotatory epinephrine, whether natural or synthetic, is from 15 to 20 times more active than the dextro-rotatory type. H. D.

Pathological action of arsenicals upon adrenals. W. H. BROWN AND L. PEARCE. *Proc. Nat. Acad. Sci.* 1, 462–3(1915).—Arsenicals produce various pathological conditions of the adrenals, causing vascular changes, alterations in the lipoid content, cellular degeneration, and lessening of the chromaffin content of the gland. H. D.

The physiological action of some of the amines produced by intestinal putrefaction. ALLAN C. EUSTIS. Tulane Univ. *Biochem. Bull.* 2, 159(1912).—Doses of putrescine and cadaverine as small as 0.1 mg., injected intravenously, are instantly fatal to guinea pigs. Non-fatal doses produced a lowering of blood pressure, dyspnea, salivation and prostration. Fifty mg. of PhEtNH is immediately fatal; 30 mg. is fatal in 2 min. with immediate paralysis of the respiratory center; 20 mg. produces a distinct chill, followed by prostration but with ultimate recovery. β-Imidazolylethylamine in doses of 10 mg. causes death in 3 min. with typical anaphylactic shock. A. P. LOTHROP.

The localization of the convulsive action of potassium thiocyanate. CHARLES C. LIEB. Columbia Univ. *Biochem. Bull.* 2, 459–60(1913).—The convulsions are of reflex origin, and apparently can be best explained by assuming that KCNS causes in the cord changes resembling those induced by strychnine. A. P. LOTHROP.

The dextrose and diastase content of the blood as affected by ether anesthesia of animals fed on different diets. ELLISON L. ROSS AND HUGH MCGUIGAN. Northwestern Univ. Med. School. *J. Biol. Chem.* 22, 407–16(1915).—The dextrose and diastase contents of the blood of 10 dogs, which had been fed on a mixed diet for a week,

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were detd. at intervals before and during ether anesthesia which was continued for 2 hrs. The animals were then fed on a meat diet for a similar period and comparative detns. made. Ether anesthesia causes a hyperglucemia which is greater in dogs fed on a pure meat diet than in those on a diet contg. carbohydrate. It does not increase the diastase content of the blood. The greater part of the increase in sugar is due to the ether itself and not to asphyxia or excitement. The authors suggest the probability "that in ether anesthesia the glycogen of the liver so changes that it is more readily acted on by the diastases which are common to both blood and liver." The diastase concn. in the blood is on the av. greater in animals which have been fed on a meat diet than in those receiving a mixed diet. A. P. LOTHROP.

Peptone hypoglucemia. HUGH MCGUIGAN AND ELLISON L. ROSS. Northwestern Univ. Med. School. *J. Biol. Chem.* 22, 417–23(1915).—The expts. were divided into 3 groups: (1) those in which the animals were given ether only during the injection of the peptone soln.; (2) those in which no ether or other anesthetic was used; and (3) those in which the animals were kept under the influence of ether throughout the expt. In the 2nd group the sugar content of the blood reached a minimum in about 2 hrs. after the injection, a fall to about $^1/_2$ to $^1/_3$ of the original usually occurring. A transient increase in sugar may occur between the injection and the hypoglucemic state. In all cases ether is decidedly antagonistic to the action of peptone. The production of the hypoglucemia seems to be due to circulatory changes in the liver. The Witte peptone soln. is more active in causing a lowering of the proportion of blood sugar when it is dissolved in cold H_2O and not boiled after soln. Similar results were obtained with silk peptone and with gelatin. The low results cannot be due to the solvent effect of peptone upon Cu_2O because it was impossible to detect peptone by the ninhydrin or biuret tests in the filtrates after the removal of the proteins by coagulation in the presence of Na_2SO_4 and AcOH. A. P. LOTHROP.

Action of magnesium chloride. W. BURRIDGE. *Proc. Physiol. Soc.; J. Physiol.* 48, lviii(1914).—$MgCl_2$ may have an inhibitory action on the perfused heart. Atropine and epinephrine bring the excitability back to normal and the heart restarts beating in the presence of Mg salts. J. F. LYMAN.

Chemoserotherapy of experimental pneumococcal infection. HENRY F. MOORE. Rockefeller Inst. *J. Exp. Med.* 22, 389–400(1915).—A single small dose of ethylhydrocuprein, which by itself has practically no protective effect against exptl. pneumococcal infection in mice, is capable of increasing the threshold value of the type homologous antipneumococcus serum at least 50 times. The effect is proportionately many times greater than a simple summation of the protective effects of these 2 substances. No such effect is obtained when the antiserum used is one produced against a strain of pneumococcus from a group other than that to which the infecting pneumococcus belongs G. M. MEYER.

Physiological properties of electrolytes. C. BONGIOVANNI. Rimini. *Boll. chim. farm.* 54, 65–8(1915).—B. discusses various investigations which have been directed to the study of the relationship between the toxicity of electrolytes and the dissociation of the latter. The method (injection of a mixt. of $HgCl_2$ and NaCl, the degree of dissociation of the former being thereby decreased) first employed by Sabbatani in studying the effect of varying degrees of dissociation on the toxicity of $HgCl_2$ is criticized on the ground that the decrease in the degree of dissociation of $HgCl_2$ is accompanied by the formation of a double salt of the type Na_2HgCl_4 or $NaHgCl_3$ so that the change in toxicity may be due in part, at least, to this compd. This method is considered to be correct in principle, provided it is shown that no compd. is formed by the salts which have an ion in common. The use of Na_2SO_4 (Sabbatani finally substituted Na_2SO_4 for NaCl) is still more objectionable for use in connection with salts

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of Pb, Hg, Ag and Cu, inasmuch as complex compds. are formed which are probably even more stable than the double salt formed by $HgCl_2$ and NaCl. Sabbatani claims to have confirmed his 1st conclusions (indicated above) by expts. with $HgCl_2$, HgI_2 and $Hg(CN)_2$ in which the disinfecting power of these compds. was found to be approx. proportional to their degree of dissociation; B. holds that these results are inconclusive inasmuch as different compds. have been compared instead of the same compd. at different degrees of dissociation. B. further criticizes the expts. of Bottazzi (study of the disinfecting power of $HgCl_2$ and $AgNO_3$ in alc. soln.) and discusses the distinction between the toxicity and caustic action of acids and bases. H. S. PAINE.

Biological effects of radioactivity. A. RICHARDS. *Science* 42, 287–300(1915).—Life processes are accelerated by brief exposures, while a stronger treatment inhibits or destroys life. Chromation of the cells may be injured. The modifiability of enzymes under the action of the rays plays an important part in the resulting effects either directly or indirectly. R. reviews previous work in this field. H. D.

A study of the influence of electricity on metabolism. MATTHEW STEEL. Long Island Med. College. *Biochem. Bull.* 3, 309(1914).—In 2 expts. of 11 days each, a normal, healthy adult on a uniform non-purine diet was subjected for 30 min. to Faradic sinusoidal currents of uniform strength but of different frequencies of interruption. There was an increase of 100–200 cc. in the daily vol. of urine and a slight increase in total N and creatinine. The amts. of the other nitrogenous constituents were remarkably const. through all the periods. Urorosein and nitrites were present in the urine specimens during the periods of elec. treatment. A. P. LOTHROP.

Potassium contractions. W. BURRIDGE. *Proc. Physiol. Soc.; J. Physiol.* 48, lviii(1914).—Perfusion of frog heart with K salts can evoke 2 contractions differing in amplitude but which, when superimposed on each other, give a const. (*C*) for a given heart. *C* represents the max. amplitude attainable by spontaneous contractions in that heart. J. F. LYMAN.

Effects of epinephrine. W. BURRIDGE. *Proc. Physiol. Soc.; J. Physiol.* 48, lx (1914).—Epinephrine can alter the reaction of the heart to Ca^{++} so that activity may be maintained when perfused with a soln. abnormally low in Ca^{++}. Epinephrine may restore activity after perfusing with a soln. very low in Ca^{++} until no beats can be recorded. Beating may be restored by epinephrine after inhibition with K^+. J. F. LYMAN.

Epinephrine and perfusing solutions. W. BURRIDGE. *Proc. Physiol. Soc.; J. Physiol.* 48, lxi(1914).—It has not been found possible to obtain a soln. in which the heart behaves as if perfused with blood. The action of blood is closely approximated by adding to the perfusing fluid sufficient K^+ to stop the heart in the dilated condition and then restart by adding a trace of epinephrine (1 to 10,000,000) to the perfusing soln. J. F. LYMAN.

Equilibrium in salt perfusing solutions. W. BURRIDGE. *Proc. Physiol. Soc.; J. Physiol.* 48, lxi(1914).—Any salt or drug tested when added to a perfusing soln. altered the amt. of Ca^{++} required to elicit beats 0.5 max. in amplitude. J. F. LYMAN.

Toxicity of sodium pyrophosphate administered in food; with a note on toxic cottonseed oil. W. L. SYMES AND J. A. GARDNER. *Biochem. J.* 9, 9–16(1915).—The the results confirm the findings of Gamgee, Priestley and Larmuth (*J. Anat. Physiol.* 11, 253, 273(1877)) and Starkenstein (*C. A.* 5, 2655) that $Na_4P_2O_7$ administered (with oats, bran, and chopped cabbage) to rabbits, cats and rats, is non-toxic, though to sheep it is toxic. In the early stages of life both the ortho- and pyrophosphates retard growth. Rats fed on oats and bread, plus 5 g. of cottonseed meal (containing 0.07 g. of $Na_4P_2O_7.10$ aq.), succumbed readily, while those which had 0.5 g. of cryst. $Na_4P_2O_7$

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added to the diet passed 9 weeks without apparent change. A preliminary extn. of the cottonseed with alc. and ether reduced its toxicity. B. H.

I. ZOÖLOGY

R. A. GORTNER.

Intracellular digestion and assimilation in amphibian embryos. G. E. COGHILL. *Science* 42, 347–50(1915).—The yolk globules in the living cells of ambystoma embryos may be differentiated, by means of a double stain of janus green and neutral red in an isotonic salt solution, into two types designated as α and β globules. These globules have excrescences upon their surface which the author calls α and β bodies, resp. The significance of these bodies in the life of the cell is discussed. H. D.

Digestive process in limulus. HELEN I. MATTILL AND H. A. MATTILL. *Proc. Soc. Biol. Chem.; J. Biol. Chem.* 20, xxii(1915).—"The alimentary tract comprizes esophagus, stomach, intestine and end-gut; all are chitinous except the long, straight intestine. A pyloric valve is invaginated into the intestine. From the intestine, 2 pairs of ducts lead into the large digestive gland (liver) which is inextricably intertwined with the gonads; this mass fills the body cavity. The entire tract is alk. By means of a glass tube a red-brown liquid is sometimes obtainable from the stomach, which possesses the same digestive powers as the intestinal contents, a protease (leucine and tyrosine from fibrin), an amylase-maltase (dextrose from starch), and a lipase (litmus-milk). Exts. of the intestinal mucosa and of the digestive gland showed the same digestive activity. The source of the secretion and the place of absorption are not yet certain. The intestine is filled with a clear, formless, jelly-like mass which completely invests and infiltrates the intestinal contents, and which has, perhaps, the same function as the peritrophic membrane in insects, protecting the epithelium and allowing dissolved material to pass out, and into the digestive gland. This jelly does not show carbohydrate on hydrolysis....." I. GREENWALD.

Non-toxicity of inorganic colloid solutions upon protozoa. MAX MORSE. Trinity College. *Biochem. Bull.* 2, 161–2(1912).—Colloidal Pt causes no augmentation of division-frequence or size of the organism and exerts no toxic action upon *Paramecium* when used as a medium in which the cultures are permitted to rest. A. P. L.

Accelerative action of slight degrees of irradiation on animal eggs. V. HAECKER AND N. LEBEDINSKY. Halle. *Arch. Mikr. Anat.* 85, 555–60(1914); *Zentr. Biochem. Biophys.* 17, 629(1915); cf. *C. A.* 8, 967.—H. and L. investigated the combined action of Et_2O and Ra or Röntgen rays on eggs and embryos. In the case of copepod eggs it was found that eggs prepd. (sensitized, "hyperembryonized") with Et_2O were affected by irradiation to a greater extent than non-etherized eggs even when the amt. of Et_2O *per se* had an accelerative action on development. In the case of axolotl embryos it was found that shorter and less intense meso-Th or Röntgen irradiation had an accelerative action; this agrees with the observations of Hertwig in the case of plants. H. S. PAINE.

Eyes of nocturnal insects. E. BUGINON AND N. POPOV. *15 Vers. "Assoc. anat." Lausanne* 1913; *Arch. vergl. Ophth.* 4, 362(1914); *Zentr. Biochem. Biophys.* 17, 644–5 (1915).—When subjected to sidewise illumination in the dark the eyes of night moths and other nocturnal insects cast a beautiful red or reddish yellow luster which is due to reflection and is explained by the presence of a substance similar to visual purple. This color gradually fades in exhausted animals and after intense illumination and disappears soon after death. The red pigment is sol. in alc. and $CHCl_3$. The retinal elements are abundantly impregnated with the diffusely infiltrated pigment. The pigment content of the cells of nocturnal eyes is slight; the pigment granules are very mobile. H. S. PAINE.

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Can the animal organism utilize carbon monoxide? MARIA KROGH. Univ. Copenhagen. *Arch. ges. Physiol.* 162, 94–8(1915).—CO is not destroyed by the mealworm. No combustible gas is formed by the fasting larva. The metabolism is nearly constant and is independent of the CO content of the air. The respiratory quotient indicates a combustion of fat. C. J. WEST.

The adaptability of amphibia to external liquid media, by means of the regulation of the osmotic pressure of their body fluids. VI. The importance of lymph sacs. BRUNO BRUNACCI. *Atti accad. Lincei* 24, I, 992–5(1915); cf. *C. A.* 8, 3475; 9, 1944, 2268.—In recent expts. B. has noted the presence or absence of lymph in the lymph sacs of *Rana esculenta* immersed for various periods in various Ringer solns. or in soft H_2O. He found that in frogs kept in soft or distd. H_2O there is no accumulation in the lymph sacs. The greatest accumulation is during the first hrs. and remains high for 8–10 days. Thus the lymph sacs are important in the osmotic regulation of frogs. B. attempted to verify these ideas by opening the larger lymph sacs either (1) of frogs immersed in hypertonic Ringer solns. or (2) in those immersed in running soft water, after adaptation to a hypertonic saline medium. Control expts. were made without injury to the lymph sacs and these animals all lived through the expts. All others died except those placed in soft water. The autopsies showed marked cutaneous and diffuse hemorrhage in the muscles, etc. The heart was stopped in diastole. From the results it is concluded that the integrity of all the lymph sacs examd. is necessary for frogs immersed in saline hypertonic solns. in order to maintain life. The lateral sacs are more important than the cranio-dorsal and abdominal ones; in fact the frogs in which the former were opened died more quickly than those in which the latter were opened. This coincides with former observations since it was the lateral lymph sacs more than the others that became filled with lymph. Their importance is even more manifest in the animals which were transferred from normal media to the hypertonic. Frogs adapted to hypertonic media and transferred with open lymph sacs to soft water lived throughout the expts. E. J. WITZEMANN.

12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

Vinegar. A. MCGILL. Inland Revenue Dept., Ottawa, Canada, *Bull.* 313, 45 pp.(1915).—Analyses of 245 samples of vinegar purchased in Canada under the names: malt vinegar, cider vinegar, white wine vinegar and various vinegars. 41 out of 47 sold as white wine vinegars were not white wine vinegars; 23 sold as malt vinegars and 5 sold as cider vinegars did not belong to these classes. E. H.

Jams. A. MCGILL. Lab. Internal Rev. Dept., Ottawa, Canada, *Bull.* 309, 33 pp.(1915).—Report of the analysis of 227 samples. Total and sol. solids and polarizations before and after inversion were detd. and tests for preservatives and artificial color were made. P. B. DUNBAR.

Bran. A. MCGILL. Lab. Inland Rev. Dept., Ottawa, Canada, *Bull.* 302, 23 pp. (1915).—The standards for bran legalized by Order in Council states that "Bran is the product of milling of wheat or other grain and contains not less than 14% of proteins, not less than 3% fat and not more than 10% of crude fiber and must be free from vital seeds of any of the noxious weeds defined by the Governor in Council under 'The Seed Control Act.'" A table gives the results of 187 analyses of bran of which 183 meet the nutritive requirements, and 11 show excess noxious weed seeds. H. A. P.

The composition of Hawaiian fruits and nuts. ALICE R. THOMPSON. *Hawaii Sta. Rpt.* 1914, pp. 62–73; *Expt. Sta. Rec.* 32, 761(1915).—Analyses were made of

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normal and fully ripe samples of a large number of Hawaiian fruits and nuts including the mango, avocado, banana, breadfruit, Jack fruit, papaya, and guava. A bunch of green Chinese bananas was allowed to ripen in the lab. Analyses of the fruit were made when very green, when slightly yellow, and when entirely ripe. Papayas were examd. in several stages of ripeness, ranging from fruit which was immature and undersized to that fully ripe. The total solids of the banana decreased slightly during ripening. "The insol. solids are almost as high as the total solids in the green banana, but decrease very rapidly on ripening, and in the ripe fruit amount to less than 3%. The ash is high throughout and does not change appreciably. The acid content is but a few tenths of 1% and appears to reach its max. when the fruit is half ripe, after which it decreases. The protein is fairly high and remains const." During ripening the starch was transformed into sugar. "When green, the starch is exceedingly high, amounting to about 20%, while the sucrose and reducing sugars amount to a few tenths %. At the half-ripe stage the sugars have increased several % and in about the same proportion that the starch has decreased. In the fully ripened stage the sugars have increased greatly and the starch has almost disappeared. The hydrolyzable carbohydrates, other than starch or sucrose, are small in amts." In papaya the total solids were low throughout the ripening process and increased as the fruit ripened. The insol. solids are about 3% in the green fruit and decrease to about 1% in the ripe fruit. The ash, acid, and protein occur in small quantities and are quite const. The fruit contains not more than a trace of sucrose. The reducing sugars in the green fruit amount to over 2%, but increase rapidly as the fruit increases in size and approaches ripeness. The hydrolyzable carbohydrates are almost nil, and fat, fiber, and undetd. matter occur only in small amts. It is logical to conclude, therefore, that, as the fruit when green has no store of carbohydrates upon which to draw, it must obtain its sugars by translocation from the trunk of the tree. P. B. DUNBAR.

The analysis and composition of some proprietary foods for infants. J. L. BAKER. *Rpts. Local Govt. Bd. (Gt. Brit.), Pub. Health and Med. Subjs.* [*N. S.*] 80, 49–83(1914); *Expt. Sta. Rec.* 32, 660–1(1915).—Analytical data are given regarding a number of different kinds of these products. The foods are classified as follows: Those consisting of dried cow milk mixed with hydrolyzed starch products or malt flour; foods consisting for the most part of ground meals such as wheat flour, lentils, oatmeal or arrow-root, and in which no alteration of the starch, other than that caused by heating, has taken place during manuf.; foods consisting of ground meals but mixed with a proportion of malt flour or malt ext. (these foods when prepared for use contain the starch in a gelatinized condition); foods in which the starch is altered during the process of prepn. according to directions; and partially or wholly altered starch foods, in which the starch or some of it has been converted into sol. products during the process of manuf. Most of the foods examd. showed a deficiency in fat and had a protein content approx. equal to that of av. wheat flour. P. B. DUNBAR.

Regulations of the Massachusetts State Department of Health relative to methods for the estimation of total solids and acetic acid in vinegar. A. J. MCLAUGHLIN. *Pub. Health Bull.* 2, 159(1915).—*Total solids:* Evap. 10 cc. of filtered vinegar in a tared flat-bottomed Pt dish of 50 mm. diam. on H_2O bath to a thick sirup and dry exactly $2^1/_2$ hrs. in drying oven at temp. of boiling H_2O; cool and weigh. It is essential to use a flat-bottomed dish. *Total acids:* Titrate an amt. of sample dild. until it appears slightly colored, with standard alkali, using phenolphthalein as indicator. One cc. of 0.1 *N* alkali is equiv. to 0.0060 g. $C_2H_4O_2$. J. GAUB.

Direct determination of volatile oil of cloves by distillation with steam. JULIUS HORTVET. *J. Assoc. Official Agr. Chem.* 1, 154–7(1915).—Reich's method (cf. *C. A.* 4, 81) was modified as follows: Place 2 g. cloves in the inner tube of the app. for the

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detn. of volatile acid in wine (described in *C. A.* 4, 623) and add 25 cc. of 20% NaCl soln. Place 250 cc. of 20% NaCl soln. in the outer flask, close the app. and attach to the condenser. Distil 225 cc. wash distillate into a separatory funnel with 35 cc. of ether, shake and allow to stand before sepg. Make 3 more extns. with 25, 15 and 10 cc. ether. Wash ether extns. with an equal vol. H_2O, pass ether through a dry filter and wash with a little ether into a tared dish. Allow ether to evap. spontaneously and weigh dish and contents. Results on 19 samples of cloves showed, with one exception, that oil by distn. was from 0.24 to 2.78% lower than the volatile ether ext. detd. by the official method. Tests showed that practically all the oil had been distd. H. considers results obtained by this method as reliable as those obtained by the official method. E. L. P. TREUTHARDT.

Report on flavoring extracts (1912). A. E. PAUL. *J. Assoc. Official Agr. Chem.* 1, 146–54(1915).—Analyses were reported for 7 authentic vanilla exts. Vanillin was present from 0.14 to 0.30% and Pb nos. ran from 0.47 to 0.76 in the straight exts. A modification of Wichmann's test for coumarin (*C. A.* 6, 1326) was tested by 11 collaborators and recommended for further consideration. Detns. of vanillin by Folin's method (*C. A.* 7, 1769) made by 14 collaborators agreed closely with results obtained by the provisional method (U. S. Dept. Agr., Bur. Chem., *Bull.* 107(1907)). This method should be studied further especially on materials which interfere with the provisional method. Cocoa, salicylic and benzoic acids give positive tests for vanillin with Folin's reagent. Satisfactory detns. of oil in peppermint exts. were made by 17 analysts using Howard's modified method (*C. A.* 2, 1730 and 5, 1975). Three collaborators also reported results using Hortvet's original method (*C. A.* 3, 1189) and his later modification in which the alc.-brine soln. is drawn off. The following modification of Howard's method for detn. of oil in peppermint ext. was recommended for adoption as a provisional method: Pipet 10 cc. of the ext. into a Babcock milk bottle, add 1 cc. CS_2, mix, add 25 cc. cold H_2O and 1 cc. concd. HCl. Shake at least 1 min. Centrifuge 6 min. and draw off all but .3 or 4 cc. of the supernatant liquid by means of a small-bore glass tube. Connect the bottle with a filter pump, immerse in nearly boiling H_2O, start the pump and shake gently. When the CS_2 is practically all removed and the oil floats, shake violently and immerse in boiling H_2O for a few secs. Cool, fill bottle to neck with satd. NaCl soln. at room temp., centrifuge 3 min. and read vol. of oil from top of the meniscus. Reading multiplied by 2 = % oil by vol. E. L. P. TREUTHARDT.

Report on colors (1912). W. E. MATHEWSON. *J. Assoc. Official Agr. Chem.* 1, 113–20(1915).—Exam. of 5 samples of cordials colored with mixts. of dyes was made by a number of collaborators using the procedure proposed in 1911 (*C. A.* 7, 184) and a table of solubility of common food dyes when extd. from aq. solns. by immiscible solvents. The procedure was best for acid dyes containing phenolic OH groups; it was more or less unsatisfactory for lower sulfonated triphenylmethane dyes and some basic colors. Confirmatory chem. tests are proposed but experimental results with them are not given. E. L. P. TREUTHARDT.

Fruit products. H. C. GORE. *J. Assoc. Official Agr. Chem.* 1, 120–30(1915). —Excessive amounts of uranyl acetate cause marked depressions of the max. polarization of malic and tartaric acid with this reagent. Suitable amts. of acetic acid almost entirely restore the max. rotation in the case of malic but only partially in the case of tartaric acid. NH_4 molybdate greatly increases the rotation of these acids, the effect differing markedly depending on whether the acid is neutralized or not. Malic acid with suitable amts. of NH_4 molybdate and acetic acid gives very large polarizations, practically proportional to the amt. of acid present, but tartaric acid does not

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give proportional readings. Lactic acid is only slightly affected by either reagent. H. A. LEFFER.

Determination of fat in cheese particularly by the method of Bondzynski. ED. GURY. *Mitt. Lebensm. Hyg.* 5, 361–5(1915).—To avoid the extn. of lactic acid G. recommends the use of petroleum ether as a solvent in this method. H. A. P.

The composition of Dutch cheese, and the system of control for whole-milk Dutch cheese. J. J. L. VAN RIJN. *Analyst* 40, 391–8(1915).—Experience has shown that every maker of Gouda cheese is able to produce an article containing not less than 45% fat in the dry matter. The av. fat content in the dry matter for the years 1907 to 1913 inclusive varied from 48.5 to 50.6%. Analyses of 32 samples of full cream Gouda cheese, milk and whey are reported, showing the following max. and min. figures, resp.: water in cheese 45.3, 38.8%, fat in cheese 31.5, 25.1%, fat in dry substance of cheese 54.1, 44.2%, fat in milk 4.22, 2.51%, fat in whey 0.86, 0.20%, non-fatty solids in milk 8.58, 8.16%. The Holland Agr. Society's Control Sta. which is under government supervision guarantees all cheese which bears its stamp to be made from whole milk, to contain not less than 45% fat in the dry matter and not more than the normal amt. of moisture. Control stations for the supervision of skimmed cheese have also been organized and the operation of these stations is described. Eighteen samples of full cream Cheddar cheese showed the following max. and min. figures: fat in milk 3.40, 2.75%, fat in cheese 34.3, 28.9%, fat in dry substance 54.5, 49.4%. Fourteen samples of Dutch Cheshire cheese showed max. and min. as follows: fat in milk 3.80, 2.60%, fat in cheese 30.8, 20.3%, fat in dry substance 53.4, 47.9%. It is generally agreed that Edam cheese which is not considered a whole milk cheese should not contain less than 40% fat in the dry substance. P. B. DUNBAR.

The importance of milk sugar in judging milk. A. GABATHULER. *Z. Fleisch-u. Milchhyg.* 25, 97–100; *Bull. Agr. Intelligence* 6, 623–4(1915).—The milk sugar content of milk is liable to individual variations and depends upon the lactation period, the amt. of rest enjoyed by the animal (repose being favorable to its production) and upon the state of health of the mammary glands. The smallest disturbance of the activity of the glands shows itself in a decrease in the formation of milk sugar. At the beginning of the lactation period, when these glands are not yet in full activity, the amt. of the latter substance is small; it then soon reaches its max., to sink once more towards the end of the period. Heat has little effect upon the production of milk sugar (the amt. increases afterward for a short time); castration is without any noticeable influence. The sugar content is highest in the middle of milking and decreases towards the end. A salty taste of milk does not depend upon an increased secretion of salt, but chiefly upon a diminished production of milk sugar. G. recommends that in judging milk from a hygienic point its lactose content be taken into account. P. B. D.

Milk preserved by freezing. G. FASCETTI. *Stas. sper. agr. ital.* 48, 61–5(1915). —The effect of freezing has been known for years (Vieth in 1886 made the first expts.). Milk frozen in blocks or cakes, seps. into layers of very different compn. In the case of an original milk having a sp. gr. of 1.0317, the top portion after freezing a milk block therefrom had a sp. gr. of 1.0233, the portion on the sides 1.0165 and the central liquid zone 1.0534. Another test, using the Audifren Singrün app., showed the top portion of the frozen milk cake to have 3.8% fat, the middle portion 1.00% and the lower part 1.70. Two tables give the complete analysis of the 3 portions of the frozen milk cakes. J. A. LECLERC.

Clotted cream. W. SADLER. *J. Board Agr.* 22, 105–16(1915); *J. Soc. Chem. Ind.* 34, 678.—The addition of water to the milk before the pans are set, to sep. the cream is found to act adversely on the flavor, texture, and keeping quality; it does

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not affect the fat content or add to the wt. of the cream. The value of the scald milk is also lowered, and the amt. of sediment remaining in the pans is not diminished. With a suitable rich milk, clotted cream can be made in any locality, due care being taken to maintain during scalding a uniform temp. of 82–5° for a uniform time (25–30 min.). The yield is about 1 lb. of cream from 20.5 to 23 lbs. of milk. The flavor and keeping quality are mostly detd. by bacteriological factors. Cream with a characteristic flavor is made by scalding for 1.5–2 hrs. over the glowing embers of a peat fire. Samples of clotted cream investigated kept well for 36, 48 and 60 hrs., resp., after skimming. H. A. LEPPER.

Method for determining manurial pollution of milk. J. WEINZIRL AND M. V. VELDEE. *Am. J. Pub. Health* 5, 862–6(1915).—The *B. coli* test in milk indicates the degree of manurial pollution, but is, of course, useless after the milk has been pasteurized. *B. sporogenes* appears to be well suited, since it is a spore-producer; the following satisfactory test was devized: Place 10 cc. of milk in a test tube and cover with a layer of paraffin $^1/_8$ inch thick; then heat to 80° for 10 min., cool and incubate. The presence of the organism is seen by the raising of the plug of paraffin in the tube. If *B. vulgaris* is present digestion without gas takes place. Expts. show that there are 10,000 *B. sporogenes* per g. in manure. Hence if the organism is present in 10 cc. there is at least 1 g. of manure in 100 l. of milk. Expts. have shown that this method can be used for any kind of milk with good results. J. GAUB.

The chemical investigation of honey. H. KUTTENKEULER. *Naturwissenschaften* 3, 443–6(1915).—A detailed review including literature references for the period 1907 to 1914 inclusive. C. G. F.

Dextrose content of the egg of the common fowl. M. E. PENNINGTON, N. HENDRICKSON, E. L. CONNOLLY AND B. M. HENDRIX. U. S. Dept. Agric. *Proc. Soc. Biol. Chem.; J. Biol. Chem.* 20, xxi(1915).—Dextrose was detd. in the filtrates from the heat coagula, after treatment with alumina cream. The values found for fresh hen eggs were: whites 0.3 to 0.6%, av. 0.44%; yolks 0.08 to 0.24%, av. 0.08%. Storage at 32° does not affect the dextrose content unless the eggs are infected. During incubation the amt. of dextrose decreases in fertile, but is unaffected in non-fertile eggs. Commercial frozen egg contains 0.28 to 0.38%, averaging 0.34%. Shell eggs, except musty eggs, unfit for food, contain less dextrose than do good eggs. A low dextrose content in dry egg does not indicate the nature of the eggs used, for the dextrose may be lost in drying. I. GREENWALD.

Food value of the potato plant as hay and sour fodder. WILHELM VÖLTZ. *Z. Spiritusind.* 38, 276(1915).—Hay from the herbaceous parts of the potato plant proved to be a cattle fodder equivalent, if not superior, to grass hay with regard to nutritive substances and to production of milk. The mowing of the herb has to take place not earlier than 8 days previous to the potato harvest. The herb may also be worked into sour fodder by acidifying preferably with pure culture lactic bacteria. L. W. HAAS.

The water-content of meat products. EUGEN SEEL. Stuttgart. *Chem. Ztg.* 39, 409–10, 431–2(1915).—Feder's "ratio no.," 4, for the % H_2O to "organic non-fat" is, as a rule, too high, and should be 3.5 in chopped meats. The legitimate % H_2O in sausages is so dependent on the kind of meat used, the method of manuf. and the age of the product that great care must be exercised in the use of the "ratio no." Analyses of sausages are given which show the no. to vary from 3.5 to 5.5. Cf. *C. A.* 7, 3170; 8, 3601. J. H. MOORE.

Wöppchenbrot, Westphalian blood bread. O. RAMMSTEDT. *Z. angew. Chem.* 28, I, 236–8(1915).—This bread, prepared mainly from the blood and fat of the pig

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and coarse rye meal, has the following % composition: moisture 46.77, ether ext. 6.41, ash 2.23, H_2O-sol. ash 2.07, H_2O-sol. solids 12.36, crude fiber 2.04, total protein 10.27, protein digestible with pepsin-HCl 9.66, and protein indigestible 0.61%.

H. A. LEPPER.

Determination of chlorine in bread. K. SCHERINGA. *Chem. Weekblad* 12, 749–51 (1915).—Of 9 methods studied S. recommends for rapid and accurate work the following: Boil 2 g. powdered bread with 100 g. H_2O and 5 cc. concd. H_2SO_4 for 15–30 min.; cool, add 5 cc. HNO_3 and a slight excess of 0.1 *N* $AgNO_3$; shake a few min., filter and wash the ppt. with H_2O containing a little HNO_3; titrate the filtrate. J. T. FLOHIL.

Full meal of Swiss mills. SCHAFFER. *Mitt. Lebensm. Hyg.* 5, 365–6(1915). —According to regulations of the Bundesrat, 80% of the wheat must be obtained as meal. Complete analyses of 8 standards of "full meal" are given, showing fat fiber, protein, ash and carbohydrate content. H. A. PIPER.

Lime seeds (TEMPANY) 27.

U. S., 1,153,925, Sept. 21. R. G. JACKSON. **A food mixture** is made by grinding whole oats 20 with whole wheat 20 parts, into cut granules including the bran hulls, and mixing with finely comminuted wheat 20, prime wheat bran 20 and ground flax 20 parts.

U. S., 1,154,059, Sept. 21. C. A. O. ROSELL. **A solid, easily crumbled food** is formed of maize oil 50, ground roasted sesame seed, almonds, peanuts or cocoanut meat 50, corn sirup 60–80 and sucrose 20–40 parts.

U. S., 1,154,363, Sept. 21. F. G. BERESFORD. **Olives** are prepared for use by successive treatment with an alk. soln., *e. g.*, dil. KOH or NaOH, to neutralize their acidity and remove astringent substances, washing and treatment with a soln. of NaCl and finally drying until they are approx. anhydrous.

Brit., 13,011, July 8, 1913. SIR G. WATT. **Treating cacao.** Cf. *C. A.* 9, 111.

Brit., 12,670, May 22, 1914. R. H. ANNISON. App. for **drying, mixing, moistening,** and otherwise treating **copra** and other materials in bulk comprizes a series of superposed tables which may be perforated and over which pass a series of transverse or slightly inclined scrapers mounted on endless chains and carrying at their ends rollers running on tracks. The blades are cut away in relatively staggered positions so that the material is mixed as it travels along. From the end of each table the material falls to the next. Heating pipes or app. may be arranged beneath the tables, or the material may be sprayed by water pipes. The tables may be concave in cross-section. Air is driven in by a fan over a drying app. and passes into the casing through the floor which is provided with louvers.

Brit., 12,928, May 26, 1914. B. SCHWENGER. **Smoking meat, fish,** etc., in a chamber by sawdust, etc., ignited by a gas-jet to which air is supplied by a blower and which is deflected by a hood. Air for drying is supplied through a pipe. The supply pipes have control valves, and the gas supply can be turned off after the sawdust is ignited.

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14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

Contribution to the estimation of hardness in natural waters with reference to alkalies. OTTO MAYER. Munich. *Z. anal. Chem.* 54, 289–308(1915); cf. *C. A.* 8,

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2436.—M. considers the total hardness (*E*) as made up of carbonate hardness (*K*) and non-carbonate hardness (*N*). Hardness which evolves CO_2 on boiling is called temporary (*T*), while the slightly sol. $MgCO_3$ adds its sol. portion (*m*) to the permanent hardness (*P*), which belongs to the non-carbonate hardness (*N*). Contrary to past teaching, it may happen that carbonate hardness is not precisely equiv. to temporary, nor non-carbonate hardness to permanent. *K* is detd. by titrating 200 cc. of water with 0.1 *N* HCl, to a red end reaction, using 6 drops of methyl orange (1:1000). The number of cc. of acid used multiplied by 1.4 gives the degrees of carbonate hardness. *E* is detd. by boiling 200 cc. of the neutralized water 10 min., adding an excess (30 cc. for av. water) of a 0.1 *N* "alkali-mixt." (approx. 2 g. NaOH and 3 g. Na_2CO_3 in 1 l.) and boiling 5–10 min., then transferring to a 200 cc. flask, making up to the mark and titrating an aliquot part of the clear liquid with 0.1 *N* HCl. The difference between the number of cc. alkali-mixt. added and HCl used multiplied by 1.4 gives degrees of total hardness. Wartha's method for total hardness is modified by titrating the pptd. earths directly, instead of the unused alkali, as follows: 200 cc. of the original or previously neutralized water are placed in a 400 cc. beaker with at least 10 cc. of *normal* alkali-mixt., heated to boiling, a little pumice powder added and the boiling continued gently for 5–10 min., the beaker being covered with a watch glass. The liquid is then cooled and filtered with suction using a 4 cm. sieve plate and filter paper fiber for a mat. The beaker and filter are washed 3 times with about 10 cc. of 70% alc. Strong suction is applied, then the filter is removed, folded inwards and the funnel wiped with the outside of the mat. The filter with its ppt. is returned to the beaker, treated with hot water and at least 20 cc. 0.1 *N* HCl, then boiled, cooled and the unused acid titrated with 0.1 *N* alkali, using methyl orange or azolitmin. The acid used multiplied by 1.4 gives degrees of total hardness. This procedure has proved preferable especially with very hard waters. Mg is detd. as follows: Neutralize to methyl orange 200 cc. of the water, boil 10 min. to remove CO_2, and after the addition of 50 cc. of a soln. containing 3–5 g. $BaCl_2$ and 5–10 g. $Ba(OH)_2$ per l., the boiling is continued 5 min. The liquid is then quickly cooled and made up to 200 cc. with boiled water. An aliquot part of the clear liquid is titrated with 0.1 *N* HCl. The difference between the number of cc. of acid equiv. to the Ba mixt. and the number found by titration gives the number of cc. of acid equiv. to the Ba mixt. used to ppt. the Mg. The alkali-mixt. ($NaOH + Na_2CO_3$) ppts. Ca as carbonate and Mg as hydroxide, the former as fine crystals giving a turbidity, the latter as coarse flakes enabling one to det. whether hardness comes principally from Ca or Mg. By a procedure similar to nesslerizing, an approx. estn. of Ca and Mg can be made. The alkalinity of a water calcd. as carbonate hardness may, by the presence of Na and K carbonates, be greater than the total hardness, if the non-carbonate hardness is small. For the detn. of Na and K carbonates, 1 l. of the water is evapd. in a Pt or Ni dish to 20–30 cc., cooled and filtered into a 300 cc. Erlenmeyer flask, the dish and filter washed with boiled water until the washings show only a faint red with phenolphthalein. The filtrate with washings is neutralized with 0.1 *N* HCl (methyl orange indicator) and boiled after the addition of powdered pumice, 20 cc. of 0.1 *N* alkali-mixt. is then added, boiled gently for 5 min. and cooled. The liquid is then transferred to a 110 cc. flask and made up to the mark. After thorough mixing, 100 cc. is filtered off and titrated with 0.1 *N* HCl; the figure thus obtained subtracted from 20 cc. and the difference calcd. to 110 cc. corresponds to the 0.1 *N* alkali used to ppt. the Ca and Mg; this figure subtracted from that of the first neutralization gives the number of cc. of 0.1 *N* Na and K carbonates per l. Several other methods are given for the detn. of the alkalies. The permanent part of the carbonate hardness (*m*) caused by the soln. of $MgCO_3$ is detd. by neutralizing the boiled and filtered water with 0.1 *N* HCl. The number of cc. of acid used multiplied by 2.8 gives the degrees of hardness by $MgCO_3$ in soln. From the relation between carbonate

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hardness (K) and residue on evapn. (R), M. deduces a carbonate number (KZ) which is found by multiplying the carbonate hardness by 1000 and dividing by the number of mg. of solids per l. This number (KZ) indicates in a rough way the nature of the water. The following equations are deduced from the relations of the various constituents: $E = K + N$ or $T + P$; $K = T + m$; $T = E - P$ or $K - m$; $m = K - T$; $N = E - K$; $P = E - T$ or $N + m$. Many examples drawn from expts. with Munich city water are given, also the results of an extended study of the reciprocal relations of compds. of Ca, Mg, Na and K. L. W. Riggs.

Determination of organic matter in drinking water. J. D. Filippo and H. J. Backer. *Chem. Weekblad* 12, 150–6(1915); cf. *C. A.* 9, 944.—Reducing in water inorg. impurities such as ferrous salts, nitrites, sulfides and high concns. of NH_4 salts and chlorides increases the permanganate demand. These substances were added to water with known reducing power and the permanganate consumption detd. with acid and alkaline digestion. NH_4 salts in quantities of 40 mg. NH_4 per l. or more have no effect in acid digestion and slight effect in alk. digestion. When Cl is present in a surface water in quantities greater than 500 mg. per l. the alk. digestion should be used. For a water with a low organic matter content the limit may be lowered to 250 mg. per l. When 0.05 mg. or more H_2S is present it is necessary to make a correction. For every mg. NO_2 present the permanganate figure should be reduced by 1.374. 0.1 mg. NO_2 has a marked influence. If the water contains no nitrites or sulfides it is most accurate to det. the permanganate value by digesting in acid soln. and deducting from this the value obtained by titrating in the cold without previous digestion. If both ferrous salts and nitrites are present it is best to oxidize the iron by air and deduct for the nitrite as previously described. H. L. Huekink.

Report of the committee on water supplies of the Sanitary Engineering Section of the American Public Health Association. F. F. Longley. *Am. J. Pub. Health* 5, 918–26(1915).—The uses of hypochlorite are discussed, together with the cost of such treatment, the after-effects, the tests for the presence of free Cl and the changes in bacterial flora. J. Gaub.

Hypochlorite sterilization. H. P. Bohmann. *Annual Report of the Milwaukee Water Works* 1914, 9–10.—With the use of hypo. in 1913 the typhoid fever rate was reduced to 11 per 100,000, and in 1914 to 8 per 100,000, the lowest records in 40 years. With the temp. below 38° F., 0.1 pt. per mil. Cl could not be used without imparting taste to the water. The substitution of liquid Cl for bleaching powder is suggested. E. Bartow.

Overhauling of Bubbly Creek filters after seven years. C. A. Jennings. *Eng. Record* 72, 377(1915).—Sand was found clean, gravel dirty in spots and air-pipes three-quarters full of sand and many broken at header connections. F. B.

Salt solution method used for testing centrifugal pump. Ben D. Moses. *Eng. Record* 72, 137–8(1915).—Tests carried on in the hydraulic lab. of the Univ. of Calif. on the measurement of pump discharges by the use of chemicals gave very good results. The accuracy was shown to be within 1.15%. Instructions are given as to details of carrying on such a test. Arthur Lederer.

Report of the committee on sewage works operations and analytical methods. *Am. J. Pub. Health* 5, 935–43(1915).—The most useful tests for the practical purpose of sewage works operation are discussed. The taking of samples for analysis, the measurement of the avidity for dissolved O_2 or its equivalent, the character of the suspended matter, NO_2, relative stability and tests of the sludge and bacteria were discussed. The views of operators of plants on these tests are invited, in order that a complete report can be given soon. J. Gaub.

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Report of the committee on sewerage and sewage disposal. *Am. J. Pub. Health* 5, 927–32(1915).—The tendency to-day is to adopt processes which will maintain aerobic conditions in the liquid at all stages through the plant in order to avoid nuisance. J. GAUB.

The utilization of sludge from town sewage as a source of fat. D. HOLDE. *Seifensieder-Ztg.* 41, 1151–3(1915).—The sludge is first treated with acid to break up colloids; this makes more easy the removal of water. It is then extd. with a suitable fat-solvent, the soln. drained off and the solvent distd. The residue is dark brown crude fat which may be purified by distn. The distillate is sepd., by pressing, into about 50% solid stearin, of a light brown color and indifferent odor, m. 45.3° and contg. 6.1% unsaponifiable matter, and 50% of liquid olein, having a weak odor and contg. 19.4% unsaponifiable matter. Besides this distillate there is produced about 25% pitch of com. value. The residue of sludge after extn. of fats is filter-pressed to sep. most of the water and then may be mixed with 25% its wt. of coal and converted into fuel briquets or it may be used as a fertilizer. E. H.

Chicago should no longer depend on sewage dilution. GEORGE A. SOPER, ARTHUR J. MARTIN AND JOHN D. WATSON. *Eng. Record* 72, 394(1915).—Experts recommend the filtration of the water supply and the formulation of a definite plan and policy for treatment of the domestic sewage and trade wastes. The present method of sewage disposal imposes conditions upon the waterways which are deemed unsanitary, unfair and unnecessary. FRANK BACHMANN.

Report of the committee on refuse collection and disposal. *Am. J. Pub. Health* 5, 933–4(1915).—The plants for refuse disposal in many cities are cited and attention is called to the fact that refuse collection and disposal should be worked out along engineering lines. J. GAUB.

A portable air sampling apparatus for the collection of large volumes. E. W. BROWN. *Am. J. Pub. Health* 5, 901–3(1915).—The app. consists of a wooden case 17 × 12 × 14½ inches, enclosing 2 2000 cc. bottles with gas-tight, glass stopcocks and fitted with a standard thermometer. The bottles are connected by glass and metal tubes with the inlet of a specially designed brass suction pump, which draws about 800 cc. of air at each stroke per sec. From the tables it is seen that about 15 to 25 strokes are necessary to obtain a representative sample. J. GAUB.

Expired air in relation to ventilation (WEISMAN) **11A.** The source of carbon monoxide in the air and its detection (MEYER) **11B.**

U. S., 1,153,931, Sept. 21. L. D. KINZIG. **Apparatus for softening water by chemical treatment, and maintaining constant heads of flow from the H_2O-supply and chemical-supply pipes.**

U. S., 1,153,972, Sept. 21. G. W. SWINBURNE. **Apparatus for purifying sewage by sedimentation.**

Brit., 12,413, May 20, 1914. G. W. BEMROSE. App. for **treating water with carbonic acid** or products of combustion after it has been treated with lime and soda or other reagents.

Brit., 13,235, May 29, 1914. T. K. IRWIN. **Precipitating sewage by reagents, such as acid or basic phosphates, added in excess, so as to obtain a sludge rich in fertilizing constituents.** The construction of a suitable app. is specified.

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15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

Geo-agronomical studies. BALDO MARCARELLI. *Staz. sper. agr. ital.* 48, 233–71 (1915).—The topography, geological description and explanation of the formation of agricultural soil are discussed. Tables containing mechanical analyses of the soils are given. The amt. of CaO in the top soil varies from 1.98 to 23.20, in the subsoil from 3.54 to 26.52%. J. A. LECLERC.

Formation of humus by means of vegetable compounds. A. TROUSSOFF. *Economie agricole et sylviculture* 74, 233–46(1914); *Bull. Agr. Intelligence* 6, 540.—The action of the mineral acids, both concd. and 20%, also of NaOH, Na acetate, $KMnO_4$, H_2CrO_4, H_2O_2 and H_2O was tried on various sugars, and on starch and dextrins at temps. from that of the water bath to boiling. The substances giving rise to humus are the non-oxidizing bases and acids. Reactions are produced as follows: decompn. of the original mol., dehydration, and intramolecular oxidation. Expts. using heat alone led T. to consider humus as an intermediate substance in the process of carbonization. Aldehydes promote the formation of humus only when associated with other compds., such as the polyatomic alcs.; similarly ketones are inactive when unaccompanied by other substances. L. J. GILLESPIE.

Soils of Graves County (Ky.). S. C. JONES. Kentucky Agr. Expt. Sta., *Bull.* 194, 169–97(1915).—A description of these soils with analyses. B. E. B.

Pike county soils. CYRIL G. HOPKINS, J. G. MOSIER, E. VAN ALSTINE AND F. W. GARRETT. Illinois Agr. Expt. Sta., *Soil Rept.* 11, 48 pp.(1915).—Includes a soil survey report, fertilizer trials, chemical analyses of soil types and suggestions for soil improvement. B. E. B.

McLean county soils. CYRIL G. HOPKINS, J. G. MOSIER, E. VAN ALSTINE AND F. W. GARRETT. Ill. Agr. Expt. Sta., *Soil Rept.* 2, 52 pp.(1915).—The report embraces a soil survey of the county together with fertilizer trials upon the various soil types and chemical data of interest pertaining thereto. B. E. B.

Azotobacter in Danish woods and its value for the determination of the lime requirements in woodland. F. WEIS AND C. H. BORNEBUSCH. *Dot forstlige Forsogsvaese in Denmark* 4, part 4, 319–40(1914); *Bull. Agr. Intelligence* 6, 546–8.—Some of the conclusions were: *Azotobacter* is rare in Danish forest soils, being found only in some localities rich in $CaCO_3$. The existence of other N-gathering microorganisms is inferred. The culture of *Azotobacter* in Beijerinck's soln. in which the lime is replaced by 5 g. of the soil to be studied (method of H. R. Christensen) is a rapid and easy way of detg. whether a woodland to be regenerated requires lime or not, since the Ca compds. that favor *Azotobacter* in such cultures seem to be the same which facilitate the development of those organisms which lead to the production and conservation of a good mold and favor tree (especially beech) development. L. J. G.

The effects of calcium and magnesium carbonates on nitrification. W. P. KELLEY. Honolulu. *Centr. Bakt. Parasitenk., II Abt.* 42, 577–82(1915).—K. studied the effects of $CaCO_3$ and $MgCO_3$ on the nitrification in 8 different soils with which was mixed soy bean cake meal, dried blood, or $(NH_4)_2SO_4$. The nitrogenous materials and the carbonates were thoroughly mixed with 100 g. portions of the air-dried soils, brought to optimal moisture content with sterile H_2O, then placed in tumblers and covered with watch glasses. At intervals of 1 wk. the moisture lost by evapn. was replaced with sterile H_2O. After incubating 21 days at 28–30°, the nitrate was detd. by the phenoldisulfonic acid method. In the expts. with dried blood $CaCO_3$ stimulated nitrification in 3 soils while practically no effects were produced in the remaining soils. $MgCO_3$

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on the other hand, was toxic to some extent in every soil except 1. The expts. with soy bean cake meal show that $CaCO_3$ stimulated nitrification in 5 soils, but was toxic in 1. $MgCO_3$ produced only small effects in 4 soils, but was markedly toxic in the other 4. In the nitrification $(NH_4)_2SO_4$, $CaCO_3$ produced stimulation in 3 soils while in the others no effects were observed. In this series $MgCO_3$ was toxic in 5 soils and had no effect in the others. Generally the synchronous addition of $CaCO_3$ and $MgCO_3$ produced effects similar to those of $MgCO_3$ alone. In the soils and with the nitrogenous materials with which $CaCO_3$ was most stimulating, $MgCO_3$ proved most toxic. Natural calcareous limestones produced effects similar to those of $CaCO_3$. Dolomite was not toxic in any case. It is concluded that the Ca-Mg ratio is not of great importance in bacterial activities of the soil, but that the concn. of Mg in soln. and its relation to the concn. of the other constituents are of great importance. JULIAN H. LEWIS.

Influence of manganese oxides on nitrification. G. LEONCINI. *Stas. sper. agr. ital.* 47, 777–801(1914).—Pot expts. conducted with different soils to which MnO_2 in varying amts. was added, the soils being maintained at a const. H_2O content, showed that neither the oxide nor the natural colloidal hydroxide of Mn favored nitrification when used to the extent of 28 g. per 450 of soil. A second series of expts. in which the Mn was employed at the rate of 0.035–2.2% showed that nitrification was favored by a not excessive amt. of compds. of this element. J. A. LECLERC.

Catalytic elements and fertilizers rarely used in sugar beet culture. O. MUNERATI, G. MEZZADROLI AND T. W. ZAPPAROLI. *Stas. sper. agr. ital.* 47, 817–52 (1914).—Numerous tables give the yield in number and wt. of beets per ha., the % of sugar and the amt. of sugar per ha. produced in control plots as compared to the same data obtained in plots treated with compds. of Mn, Mg, S, Pb and U.
J. A. LECLERC.

Fertilizers from Russian phosphorite. JOHN H. SNODGRASS. *Commerce Reports* 237, 139(1915).—The Ministry of Agriculture has started a thorough investigation of phosphorite deposits in Russia that is expected to last about 2 years. Deposits contg. 27–8% H_3PO_4 have been found along the Kama River. E. H.

Hastening the ripening of field and food crops. ALFRED PETTERA. *Wiener Landw. Ztg.* 65, 281–2(1915).—The ripening of potatoes can be hastened from 8 to 14 days by fertilizing with 40% potash salts and various amounts of superphosphate. Green feed crops grown on land fertilized with potash salts and superphosphate or slag meal can be harvested 8–14 days sooner than those grown on untreated soils.
C. F. MILLER.

Urine as a nitrogenous fertilizer. W. HEMPEL. *Wiener Landw. Ztg.* 65, 289 (1915).—The possibility of using human urine as a substitute for N fertilizers is suggested. When concd. to $^1/_{10}$ its vol. and mixed with peat, a product is obtained which can be transported and applied to the soil conveniently. C. F. MILLER.

Grain steeping experiments with hydrogen peroxide. JAROSLAV DEYL. *Wiener Landw. Ztg.* 65, 316–7(1915).—D. found that practically all the spores of wheat smut are killed when steeped for 12 hours in a 3% soln. of H_2O_2, neutralized by lime. At the same time, seeds thus treated germinated several days sooner than those steeped in distd. H_2O or 0.5% $CuSO_4$ soln. This stimulating effect is attributed to the radioactivity of the H_2O_2 which was found to be $^1/_{100}$ that of UO_2. D. considers that expts. ought to be carried out on a larger scale before definite conclusions can be drawn.
C. F. MILLER.

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Experiments with crude hydrogen peroxide in Istria. K. PORTELE. *Wiener Landw. Ztg.* 65, 311(1915).—Expts. carried out with grapes showed that a 3% soln. of H_2O_2 neutralized by slaked lime, is not injurious to the leaves or young shoots and can be used for spraying without danger. C. F. MILLER.

Chemical composition and valuation of lime-sulfur liquor. J. BODNÁR. Magyaróvar. *Chem. Ztg.* 39, 715–6(1915).—B. states that sulfites cannot exist in the fungicide. He has worked out a method for detg. the S as sulfide, polysulfide and thiosulfate, based on the fact that when $AgNO_3$ soln. is added to the liquor only the S combined as sulfide in the polysulfide is pptd. as Ag_2S, the remainder appearing as free S ($CaS_5 + 2AgNO_3 = Ag_2S + S_4 + Ca(NO_3)_2$), and that the $Ag_2S_2O_3$ combines with H_2O to form Ag_2S and H_2SO_4($Ag_2S_2O_3 + H_2O = Ag_2S + H_2SO_4$). Dilute 10 cc. of the liquor to 100 cc. with distd. H_2O. In a 100 cc. flask place 50 cc. 0.1 *N* $AgNO_3$ and about 20 cc. H_2O and add, with constant stirring, 10 cc. of the dil. soln., make up to 100 cc. and filter on a weighed asbestos filter in a Gooch crucible on a dry suction-flask. Transfer the crucible to another suction-flask, wash the ppt. a few times with warm H_2O, suck as dry as possible, dry 1.5 hr. in a steam oven and weigh the mixed Ag_2S and S (= *e*). The H_2SO_4 and excess of $AgNO_3$ in the filtrate are found by adding to 50 cc. of the filtrate 20–30 cc. 0.1 *N* NaCl, then 10–15 cc. 0.1 *N* NaOH and titrating back with 0.1 *N* H_2SO_4 (phenolphthalein indicator), then titrating the excess of NaCl with 0.1 *N* $AgNO_3$ (K_2CrO_4 indicator). Let *a* = cc. 0.1 *N* NaOH, *b* = cc. 0.1 *N* H_2SO_4, *c* = cc. 0.1 *N* $AgNO_3$ equiv. to the excess of 0.1 *N* NaCl added, *d* = cc. 0.1 *N* NaCl, *t* = thiosulfate S, and *s* = the sulfide S. Then, in 100 cc. of the original liquor, the g. thiosulfate S (*t*) = 0.6414 (*a* — *b*); the sulfide S (*s*) = 0.3207 (25 + *c* — *d*) — (*t*/2); the polysulfide S (*p*) = 100 *e* — 7.727 [*s* + (*t*/2)]. If the original liquor contained NaCl, to 10–20 cc. of the dil. soln. NH_4OH and H_2O_2 are added, the excess boiled off, cooled, and the NaCl titrated with 0.1 *N* $AgNO_3$. The result, as AgCl, is deducted from *p*. Results given show the method to be accurate. Cf. *C. A.* 1, 1308; 4, 2539. J. H. MOORE.

***p*-Dichlorobenzene as an insect fumigant.** A. B. DUCKETT. U. S. Dept. Agric., *Bull.* 167, 7 pp.(1915).—*p*-Dichlorobenzene acts as an excellent fumigant for various insects. It is effective only where its vapors can be closely confined, and when used at a temp. higher than 74° F. The amt. required under ordinary conditions is about 12 oz. to every 100 cu. ft. of space. A larger amt., however, is recommended, since the effect is quicker and the chance of revival of the insects is diminished. W. H. F.

Experiments in the control of wooly aphis by Duval's method. LIÉVRE. *J. soc. nationale d'horticulture France* [4] 15, 516–9(1914); *Bull. Agr. Intelligence* 6, 473–4.—Three recipes are given having sodium sulforicinate in common, with directions for using them. The 3 prepns. are stated to be capable of ridding trees of the insects without injuring the leaves. L. J. GILLESPIE.

Soil organic matter as a culture medium for *Azotobacter* (MOCKERIDGE) 11C. Bacterial test for plant food accessories (BOTTOMLEY) 11C. Recovery of ammonium molybdate used in phosphate estimations (PRESCOTT) 7.

U. S., 1,153,974, Sept. 21. L. TERRY. **An insecticide** is prepd. by boiling tobacco 12 and soda 2 lbs. in H_2O 65 gals. until the vol. of the mixt. is reduced about 8% and then pressing out the liquid.

Brit., 12,802, May 25, 1914. W. CALDERWOOD and A. E. WEBB. **An insecticide** in the form of a powder to be dissolved for use is prepd. by mixing dry soap and Na_2CO_3 or soda ash with an insecticide, such as camphor, pyrethrum-roseum, bitter apples,

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bitter aloes, gentian, quassia, hyssop, senna, or infusions of these separately or in combination.

Can., 164,154, Aug. 3, 1915. ALBERT FRANK and H. FREUDENBERG. **A fertilizer containing as an essential constituent cyanamide.**

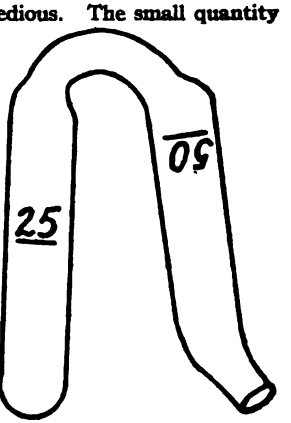
16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Application of physico-chemical methods in the analysis of wines. G. LOPRIORE. *Stas. sper. agr. ital.* 48, 5–17(1915).—A general discussion. J. A. LECLERC.

Effect of neutralizing wine upon the density of the distillate. A. CONTINO. *Stas. sper. agr. ital.* 47, 810–6(1914).—Tables of results show that the density is decreased, the amt. of alc. being correspondingly increased. The volatile acid in the natural distillate is many times greater than in the distillate obtained from neutralized wines. J. A. LECLERC.

Brew water analysis and a new sensitive method for the detection of detrimental microörganisms in brew waters. H. ZIKES. Vienna. *Allgem. Z. Bierbrau.-Malzfab.* 43, 235–8(1915).—Hansen's method of exam. of waters for microörganisms detrimental to beer wort is, in most cases, entirely sufficient but too tedious. The small quantity of water employed for the Hansen tests greatly depresses the sensibility of the method. Z. succeeded in overcoming this disadvantage by working in the following way: A wort of 10–12% ext. is evapd. *in vacuo* to half its vol. The wort remains nearly clear and may easily be made perfectly so by filtration. Special fermentation vessels of various capacity (1, 2, 3, 6, 12, 24, 50, 100 cc.) are employed. They bear two graduation marks (see fig.). Each vessel is filled with wort to the mark on the closed limb, sterilized in the usual manner, then filled to the second mark with the water to be tested, the content thoroughly mixed and the vessel put in an incubator at 25°. Z. states that this new method is superior in accuracy and sensitiveness to all others on account of the incomparably larger quantities of water which may be employed. The form of the fermentation vessels allows an accurate study of the growth and effects of the microörganisms present, and the presence of aerobic and anaerobic organisms is easily detectable from the appearance of the liquid in both limbs. A number of waters which proved satisfactory when examd. by the methods of Wichmann, Schlesinger and Hansen were found objectionable by the new method. L. W. HAAS.



Report on distilled spirits (1912). A. B. ADAMS. *J. Assoc. Official Agr. Chem.* 1, 143–5(1915).—A proposed modification of the Allen-Marquardt detn. for fusel oil when aldehydes are present in excess of 15 pts. per 100,000 consists, after sapon. and distn., in adding 0.5 g. *m*-phenylenediamine, refluxing 1 hr., redistg. and proceeding as usual. Detns. made on 2 samples showed that the modified method gave lower results for fusel oil in proportion to the amts. of aldehyde present. E. L. P. T.

Detection of methyl alcohol in alcoholic beverages. T. TAKAHASHI. *J. Coll. Agric., Imp. Univ. Tokyo* 5, 301–3(1915); *J. Soc. Chem. Ind.* 34, 812.—The Japanese Government prescribes Denigès' colorimetric method (*C. A.* 4, 1443, 1725) as a first test to be confirmed by the following modification of Aweng's method (*C. A.* 6, 1726): 200 cc. of the sample are treated with 3 g. of $CaCO_3$ and distd., with the aid of a fraction-

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ating column, below 80°. The distn. is repeated at as low a temp. as possible (65–70°), and 10 cc. of the distillate are shaken for 2–3 min. with 250 cc. of 1% $KMnO_4$ soln. and 10 cc. of H_2SO_4, then decolorized with an 8% soln. of oxalic acid and again distd. When the distillate ceases to give a dark red color (acetaldehyde) with Rimini's or Jeans reagent (*Ann. Farmacol.* 1898, 102–3; *Ann. farm. chim.* 1, 9(1898)) it is collected so long as it gives a blue color (CH_2O). It is redistd. after addition of 3 g. of $CaCO_3$, and then mixed with an excess of NH_3 and evapd. The official method prescribes evapn. from a water bath below 80°, but T. recommends evapn. under reduced pressure (15–20 mm.), from a bath below 45°. One drop of the liquid is then mixed with a drop of concd. $HgCl_2$ soln. on a microscope slide under observation. E. J. C.

Determination of tartaric acid (PERCIABOSCO) 7. Determination of methyl alcohol (ADAM) 7. Fruit products (GORE) 12. Apparent specific volumes of alcohol in aqueous mixtures of varying concentration (BROWN) 2.

U. S., 1,153,640, Sept. 14. I. POLLAK. **A diastase preparation** is obtained by extg. malt with H_2O containing a small amt. (preferably about 0.1–0.3%) of $Na_2S_2O_5$, which increases the diastatic activity of the ext. Cf. *C. A.* 9, 2568.

U. S., 1,153,641, Sept. 14. I. POLLAK. **Diastatic malt extract** is prepd. by repeatedly extg. malt with H_2O at 40° in the presence of $CaCO_3$ to prevent accumulation of free org. acids, saccharifying the extd. malt at 65–6°, sepg. the wort and adding to it the aq. ext. previously prepd., adding about 0.1% or less of Na formaldehyde sulfoxylate to the liquid mixt. and concg. it to a sirupy consistency *in vacuo*. The sulfoxylate increases the diastase activity. Cf. *C. A.* 9, 2570.

U. S., 1,153,992, Sept. 21. A. WOOLNER, JR. **Distilling fermented mash.** The volatile constituents are distd. from the mash in a continuous operation and the remaining slop is applied in the form of a spray or "heavy rain" on a heated surface on which it forms a thin film and is concd. The vapor from the slop is free from substances of objectionable taste or odor and is used to heat the column still in which the mash is treated.

Ger., 279,859–60–61–62, July 7, Nov. 5, 1912, Mar. 18, Apr. 2, 1913. Additions to 276,947. O. SCHULZE. **Increasing the formation of acid and sucrose, and hastening the breaking down of albumin, in the drying of green malt.**

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17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

Mercurial powder. P. G. UNNA. *Dermatol. Wochschr.* 1915, 337; *Chem. and Drug.* 86, 50(1915); *J. Soc. Chem. Ind.* 34, 683.—A good way to make Hg ointment and plasters is to triturate Hg with turpentine oil and lycopodium getting a yellow-gray powder in which Hg is completely divided. It is possible to make a powder having 33% Hg. J. GAUB.

Isotonic eye washes. G. SIBONI. *Boll. chim. farm.* 53, 729–31(1914).—S. discusses the importance of employing eye washes which are isotonic with the lachrymal fluid. The f. p. of the latter indicates that it is isotonic with a NaCl soln. which contains 14 g. per l. On the sole basis of equimol. concns. S. then calcs. the concns. of NaCl which are permissible in NaCl solns. which also contain definite proportions of medicinal substances (physostigmine salicylate, cocaine hydrochloride, pilocarpine nitrate, atropine sulfate, etc.) in order that these solns. may be isotonic with the lachrymal fluid. In the case of solns. which must contain substances (*e. g.*, $ZnSO_4$, $AgNO_3$) which are incompatible with NaCl it is suggested that the latter be replaced (*e. g.*,

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in the case of the 2 substances mentioned above) by Na_2SO_4 and $NaNO_3$, resp.; the calcns. indicated above are also made for these solns. In case medicinal substances without definite mol. wt. are employed the general formulas proposed by Cautonnet (*Boll. chim. farm.* 1911, 719) may be employed for adjusting the concn. of the soln. so that it will be isotonic with the lachrymal soln. H. S. PAINE.

The examination of chaulmoogra oil. PROBODHA C. CHATTOPADHYAY. Calcutta. *Am. J. Pharm.* 87, 473–83(1915).—Two different kinds of oils were examd.: (1) oil from *Taraktogenos Kurzii* seed, supplied by Smith, Stanistreet & Co., and mfd. by the Indian Forests Product Co., Calcutta, (2) oil containing solid fat and liquid product, mfd. by B. K. Paul & Co., Calcutta. The latter oil was filtered and the solid fat (amounting to about 50% of the total) removed. The clear filtered oil (*a*) and the sepd. fat (*b*) were separately examd. The oils are designated as follows: (1) Smith oil; (2*a*) B. K. Paul oil; (2*b*) chaulmoogra fat. Analysis: (1) *Smith oil*—pale yellow color, disagreeable taste and odor, d_{30} 0.9488, solidifying point by the titer test 11.9° remained liquid at 15°, with H_2SO_4 gave yellow color which changed rapidly to reddish brown and finally to dirty brown, Maumené no. 86°, Valenta test 101°, acid value 22.1, acid no. 3.94, free fatty acid expressed as oleic acid 11.18%, sapon. no. 226.36 (another sample gave 224.55), Hübl no. 96.58 (another sample gave 94.67), acetyl no. 19.1, sapon. value of acetylated oils (Benedikt's acetyl acid value) 423.07, ester value 204.26. (2*a*) B. K. Paul oil—pale brownish color, more intense odor than Smith oil, d_{30} 0.9471, gave two solidifying points by the titer test, *viz.*, 21.5° and 27°, solid at 15° and liquid at 30°, with H_2SO_4 same changes as Smith oil but finally acquired an olive green tint, Maumené no. 83.5°, Valenta test—oil completely dissolved in the acid at ordinary temp., acid value 88.3, acid no. 15.7, free fatty acid as oleic acid 44.39%, sapon. no. 217.57, Hübl no. 105.47 (another sample gave 101.87), acetyl no. 39.9, sapon. value of acetylated oil 268.2, ester value 129.27. Chaulmoogra fat—white, cryst. solid, solidifying point by titer test 33°, with H_2SO_4 color changes similar to B. K. Paul oil, Valenta test—readily sol. in glacial AcOH, acid value 117.69, acid no. 20.98, free fatty acid as oleic acid 59.16%, sapon. no. 228.3, Hübl no. 103.3 (another sample gave 105.39), ester value 110.6. Examn. of the fatty acids from Smith oil gave solidifying point by the titer test at 36.5°, after recrystn. from alc. and then from C_6H_6 gave 37°, sapon. no. 230.48, neutralization value 231.6, Hübl no. 98.23 (another sample gave 94.26). Fatty acids from B. K. Paul oil showed solidifying point at 33° same after recrystn. from alc. and C_6H_6, sapon. no. 233.9, neutralization value 237.5, Hübl no. 111.63 (another sample gave 109.84). The above quant. examn., as also the physical properties, show that the fatty acids abtained from the two sources have very nearly the same compn. The prepn. and properties of the Ca, Zn and Mg salts of gynocardic acid are described. Constituents of gynocardic acid: the mean mol. wt. of the acids calcd. from the neutralization values gave 242 in case of Smith acid and 236 in case of the other acids. The high neutralization value (230) indicates the presence of satd. fatty acids of the general formula $C_nH_{2n}O_2$, and this, combined with the ready soly. of the Ca and Mg salts in boiling alc., suggests the presence of lauric acid. Further, the ready decomposibility of the Ca salt, as also its soly., makes the presence of linoleic acid very probable. The various quant. detns. show that chaulmoogra oil is a mixed triglyceride of lauric, chaulmoogric and linoleic acids. The approx. % compn. calcd. from these data, gives: linoleic acid (series $C_nH_{2n-4}O_2$) 70%, oleic acid (series $C_nH_{2n-2}O_2$) 28%, lauric acid (series $C_nH_{2n}O_2$) 12%. The examn. of the other salts of the gynocardic acid, as also the detailed examn. of the individual fatty acids, is in progress. W. G. GAESSLER.

An examination of several commercial specimens of opium alkaloids or their salts. L. E. WARREN. *Am. J. Pharm.* 87, 439–64(1915).—Codeine phosphate,

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morphine sulfate, narceine, narcotine, narcotine hydrochloride, papaverine hydrochloride, and thebaine hydrochloride, used in previous pharmacological studies by Macht (*C. A.* 9, 2402) were examd. for identity and purity. The analytical findings indicate that the quality of some of the specimens examd. is fair, and of some excellent, while none should be classed as of poor quality. The presence of less than 1% of codeine sulfate in morphine sulfate probably cannot modify the pharmacologic effect of the morphine to any marked extent. Probably the same may be said of the presence of 15% of narceine hydrochloride in narceine, as in this instance the proportion of HCl amounts to only about 1% of the entire substance. Based for the most part upon information compiled from the literature, but supplemented to some extent by deductions from the results obtained in the examn. of the several previously named specimens, tentative monographs for the several substances examd. (except for codeine phosphate and morphine sulfate, which are described in the U. S. P.) have been prepd. While the lists of tests in these monographs are in no sense complete, it is believed that they are adequate both for the identification of the several substances and to insure products of a sufficient degree of purity for medicinal purposes. W. G. G.

Determination of methyl alcohol (ADAM) 7.

U. S., 1,153,402, Sept. 14. R. MÜLLER. **Acetic anhydride** is made by reaction of NO_2 on dry NaOAc, $Ca(OAc)_2$ or other acetate. Butyric or propionic anhydride may be similarly prepd. Cf. *C. A.* 9, 2292.

U. S., 1,153,985, Sept. 21. F. W. WEBER. **A stable solid hydrogen peroxide preparation** is made by mixing about 4% of carrageen moss and 60% or more of urea with a concd. soln. of H_2O_2 and cooling with ice. Crystals containing 35% of H_2O_2 are obtained. Thiocarbamide, hydrazine or hexamethylenetetramine may be used instead of urea.

U. S., 1,154,314, Sept. 21. E. HUG. **Polyhydrocolchicine**, $C_{22}H_{23}NO_6$, an amorphous, brittle, almost colorless mass, m. 100°, is prepared by hydrogenating colchicine 4, in alc. 100 and H_2O 100 parts with H under slight pressure, using 0.1 part colloidal Pd as catalyst. The product, after distg. off the alc., is extd. with $CHCl_3$ and dried *in vacuo*.

Brit., 12,238, May 18, 1914. R. NÖHRING. **Therapeutically active bile extracts.** See Ger., 280,108 (*C. A.* 9, 1371).

Brit., 12,850, May 25, 1914. A. ZUCKER. **Oxygenating dentifrices containing** persalts or peroxides, wherein alc. is employed to make up the paste in order to prevent decompn. and loss of O.

Brit., 13,013, May 27, 1914. J. RUTHERFORD. **A local anesthetic for use in dentistry consists of cocaine, epinephrine, phenol and decolorized I.**

Brit., 13,149, May 28, 1914. BADISCHE. **Aromatic amines.** See Ger., 282,568 (*C. A.* 9, 2568).

Brit., 13,227, May 29, 1914. C. A. PAZDZIERSKI. **A cosmetic consists of a mixt.,** preferably in the proportions stated, of 86.6% of Eucerinum (5% oxycholesterol and 95% ung. paraffini), 6.6% of $BiONO_3$, 4.4% of borax, 1.5% of BzOH, and 0.7% of ext. of strawberry.

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

Some American contributions to industrial chemistry. SAMUEL P. SADTLER. *Am. J. Pharm.* 87, 465–73(1915).—An address. W. G. GAESSLER.

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The engineering experiment station of the University of Illinois. E. B. PAINE. *Proc. Am. Inst. Elec. Eng.* 34, 2421–7(1915).—Description of the equipment and the nature of the investigations undertaken at the station. The mining and ceramics labs. have a floor area of 11,200 sq. ft. C. G. F.

The French chemical industry and the war. ANON. *Chem. Zig.* 39, 429–31 (1915); cf. *C. A.* 9, 1831. J. H. MOORE.

Nitrogen problem of Germany (UHLMANN) 21.

U. S., 1,153,502, Sept. 14. H. KRIEGSHEIM. **Producing oxygen.** A soln. of a hypochlorite, *e. g.*, $Ca(OCl)_2$, is caused to react with a mixt. of zeolites with a Ni, Cu, Mn, Pb or Co salt, which serves as a catalyst.

U. S., 1,153,512, Sept. 14. C. G. MUENCH. **Heat-insulating material** is formed of felted wood-pulp tailings, made into sheet form, fire-proofed, pressed and dried.

U. S., 1,153,574, Sept. 14. J. ROVIRA and H. AHRLE. **An adhesive** formed of benzine 100, Para gum 3–6 parts and 10 parts of a varnish made by dissolving celluloid in AmOAc and acetone, is used for coating paper with a thin layer of cork flour, for making mouth-pieces of cigarettes.

U. S., 1,153,686, Sept. 14. J. B. HANCOCK. **A composition for polishing woodwork** is formed by mixing powdered pumice 3.5, whites of eggs 14, oil of turpentine 6.5, camphor 1.5, oils of cassia and cloves 1.5 each, oil of sassafras 0.5, oils of rosemary and citronella 0.375 each, petroleum oil 12, MeOH 28 and H_2O 42 oz.

U. S., 1,154,145, Sept. 21. R. W. WALLACE and E. WASSMER. **Producing nitrogen.** Vapors of P are passed into a tower or chamber containing acid-resisting, refractory material on which the P condenses; air is then passed through the chamber to form P oxides and the latter are passed through a H_2O tower to obtain free N and oxy-P acids.

U. S., 1,154,161, Sept. 21. J. W. AYLSWORTH. **A fire-extinguishing liquid** is formed of CCl_4 containing about 2–20% of tetrachloronaphthalene or other halogenized aromatic hydrocarbon and 2–20% of Na tungstate, Na_2PO_4, $NaHCO_3$, $(NH_4)_2PO_4$ or other fireproofing salt. Cf. *C. A.* 9, 1192.

U. S., 1,154,171, Sept. 21. R. H. BROWNLEE and R. H. UHLINGER. **Making carbon dioxide and nitrogen.** Coal gas or other carbonaceous fuel is mixed with an excess of air above that required for complete combustion, combustion is effected in a closed chamber (*e. g.*, an internal-combustion engine) and then sufficient additional carbonaceous fuel is supplied to combine with the excess of O and produce the max. amt. of CO_2. The combustion products are then passed over a heated refractory combustion bed and then to a tower for absorbing CO_2. Cf. *C. A.* 9, 2699.

U. S., 1,154,172, Sept. 21. R. H. BROWNLEE and R. H. UHLINGER. **Making carbon dioxide and obtaining free nitrogen.** Fuel gas is added to the products of combustion of an internal-combustion engine and the mixt. is passed through a mass of highly heated refractory material to effect its combustion while supplied with just sufficient air for complete combustion with max. production of CO_2. The CO_2 and N are then sepd. by scrubbing. A mixt. of 90% N and 10% CO_2 may be used in synthesizing NH_3 with H.

U. S., 1,154,289, Sept. 21. E. COLLETT. **Concentrating dilute nitric acid.** See Brit., 7,597 (*C. A.* 8, 3102).

Brit., 12,474, May 20, 1914. GIBBS & Co., KESTNER EVAPORATOR AND ENGINEERING CO., I. B. HOBSBAWN and J. L. GRIGIONI. **Sodium chloride** is sepd. from

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$NaNO_3$ liquors, such as those obtained from caliche, by concg. the liquor until its b. p. reaches the temp. (about 123–124° under normal atm. pressure) at which the NaCl becomes insol. The temp. is ascertained by detg. the max. b. p. of a sample of the liquor under a pressure of 14.7 lbs. per sq. in. At altitudes above sea-level, the concn. is effected under a back pressure sufficient to raise working pressure to 14.7 lbs. per sq. in. The NaCl crystals are allowed to settle and are filtered or otherwise sepd. from the nitrate liquor without allowing the temp. to fall.

Brit., 12,475, May 20, 1914. GIBBS & Co., KESTNER EVAPORATOR AND ENGINEERING CO., I. B. HOBSBAWN and J. L. GRIGIONI. **Sodium nitrate**, free from or containing a predetd. proportion of NaCl, is produced from liquors obtained from caliche and other crude materials, by a process of concn. involving 2 stages, namely (1) concg. the liquor until its b. p. reaches the temp. at which the NaCl becomes insol. or a temperature lower than this and dependent upon the desired % of NaCl; (2) transferring the hot, desalted liquor to a 2nd evaporator in which the $NaNO_3$ is sepd. as crystals. The critical temp. is ascertained by detg. the max. b. p. of a sample of the liquor under normal atm. pressure (14.7 lbs. per sq. in.) and is usually about 123–124°.

Brit., 12,558, May 21, 1914. CHEM. FABRIK GRIESHEIM-ELEKTRON. Manuf. of **anhydrous hyposulfites**. See Ger., 279,389 (*C. A.* 9, 1232).

Brit., 12,600, May 22, 1914. VEREIN CHEMISCHER FABRIKEN IN MANNHEIM. In the manuf. of **nitrogen oxides** by the catalytic combustion of NH_3, the gases, subsequently to overcoming the resistance offered by the catalyst, are caused to overcome a further resistance, so that the gas which has left the catalyst is at a pressure higher than atm. pressure. Thus the gases may be passed through the catalyst consisting of a Pt-Ir wire net arranged between perforated plates, and in the gas passage behind the catalyst a cock is arranged to restrict the flow of gas.

Brit., 12,677, May 22, 1914. USHER-WALKER, LTD. and C. E. SOHN. An infusible, resilient **composition for printers' inking rollers** is made by adding hexamethylenetetramine to a mixt. of soaked glue and glycerol, and molding in molds kept heated for some time. The soaked glue is mixed with the usual proportion of glycerol and melted, and a concd. soln. of hexamethylenetetramine is added in the proportion of about 1 to 400, or between 0.2 and 1%.

Brit., 12,895, May 26, 1914. R. J. ALPE and F. MOORE. **A coating composition** for articles such as steering wheels of automobiles, consists of celluloid dissolved in amyl acetate and acetone mixed with rubber soln. in mineral naphtha, the cellulose soln. preponderating. Both solns. are preferably of somewhat viscous consistency, and a suitable coloring matter may be added to the rubber soln. The quantity of rubber soln. may be $1/_{20}$ of the celluloid soln. The coating is applied by immersing the article or by other methods, as by a brush. The dried coating may be polished, as with rotten-stone.

Brit., 13,003, May 27, 1914. PURITAS DISINFECTANTS CO. and H. C. ROUGET. **Stuffing box packing** comprises cotton fiber which is treated with rubber soln. and vulcanized. The material is then powdered or granulated and treated with grease and graphite, asbestos fiber, hemp, or other binding-material being added. Pb, Sb, or alloy in granulated form, and French chalk, may be added. The powdered or granulated cotton fiber may be obtained by vulcanizing and compressing cotton pulp into sheet form, and then grinding, chopping, or disintegrating it. A suitable compn. consists of 5% of vulcanized cotton fiber, 20% of grease and graphite, 10% of asbestos fiber or hemp, 65% of French chalk; or 30% of the French chalk may be replaced by

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Pb or Sb. The grease and graphite component may consist of half tallow or other grease and half graphite or other lubricant.

Brit., 13,332, May 30, 1914. J. E. Bucher. The process of mfg. **cyanides** with the aid of the catalytic action of Fe as described in 27,713, 1912 (*C. A.* 8, 1857) is improved by passing the materials in briquet form through a reaction zone. Other catalysts such as Cr and Mn may be used instead of Fe. The briquets may be made by pressing the mass (containing finely divided Fe, Na_2CO_3, and C) rendered plastic by heat or by admixt. of H_2O.

Brit., 13,333, May 30, 1914. P. Ferrère. **Zinc sulfite**, from which **zinc oxide** is produced, is prepd. from a Zn salt soln., such as the sulfate, by passing in SO_2 continuously and adding gradually an alk. earth oxide or hydroxide, *e. g.*, BaO, in such a manner that the quantity of oxide or hydroxide is equiv. to not more than half of the dissolved SO_2, so that the Zn remains in soln. The soln. is filtered from the $BaSO_4$, and treated for the pptn. of $ZnSO_3$. When a $ZnCl_2$ soln. is employed, filtration is unnecessary. Cf. *C. A.* 8, 410.

Can., 164,445, Aug. 24, 1915. E. Weintraub. **The process of making boron suboxide.** See U. S., 1,105,388 (*C. A.* 8, 3223).

Can., 164,456, Aug. 24, 1915. A. Holter. **Process of granulating calcium nitrate** without the formation of powder, by forming a melt of the salt, producing granules or drops of molten salt of crystalline consistency and causing such drops to move freely in counter current with a suitable gas.

Can., 164,510, Aug. 24, 1915. P. Farup. **Process of producing titanium-oxygen compounds from material containing titanium and iron,** by treating the Ti-Fe material with H_2SO_4, heating the mass so obtained to a temp. at which the Ti sulphates are decomposed while the Fe sulphates remain substantially unaltered, and then leaching the resulting mass. Cf. *C. A.* 9, 362.

Can., 164,645, Aug. 31, 1915. J. H. Lidholm. Process of producing **calcium cyanamide** from CaC_2 and N by introducing the carbide into a heated furnace chamber, supplying the furnace chamber with N, causing the introduced carbide to fall down on carbide acted upon by reaction in the chamber, and removing the formed block from the furnace chamber.

Can., 164,647, Aug. 31, 1915. J. H. Lidholm. **Process of producing calcium cyanamide from calcium carbide and nitrogen,** by using a CaC_2 containing heat absorbing but otherwise inactive substances, heating to a suitable temp. and having the N act upon the CaC_2 at an over pressure suited to the % of heat absorbing substances.

Ger., 277,054, July 19, 1910. Addition to 275,343 (*C. A.* 9, 2576). F. Hlavati. In the **synthesis of ammonia** with the use of catalyzers according to the principal patent, the ionization of the gas mixt. before conducting it over the contact body, by means of elec. sparks, is an advantage. The activity of the catalyzers is increased also by changing the temps. so that at different times the most favorable temp. for the absorption of H by the metal of the Pt group, then the most favorable temp. for the binding of the N with the Ti, and finally that temp. may prevail at which the gases are driven out again from the metals in the active state. The temp. need never exceed 500°. Finally, the reaction can be hastened by alternately increasing or reducing the pressure, according as the gases are to be absorbed or expelled.

Ital., 141,236, Apr. 22, 1914. E. Barthelmey. In a process of mfg. **litharge,** a special furnace, provided with a ventilator stirring device, permits atomizing of the fused Pb in a current of air or other gas containing O. The particles of Pb not oxidized fall back into the crucible.

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21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

Some problems in burning powdered coal. A. S. MANN. *Gen. Elec. Rev.* **18**, 920–4, 959–65(1915).—An illus. description of app. for mixing coal with air. A cast-Fe cylinder, 8 in. in diam., has 5 openings besides the discharge mouth (1 for coal, 1 for primary air and 2 for combustion air (preheated)). These 4 openings are tangential. Air valves allow a great range; and a long flame is possible. Fuel and air enter in parallel streams. These, rotating in counter directions, meet and rotation ceases; axial speed must be sufficient to keep the coal suspended and preserve the mixt. The feeder is a simple screw delivering the coal to a cavity where it is picked up by the carrying air. The fire may be maintained at a scarcely visible red and by use of a regulator may quickly be made vigorous. Primary air enters on the eductive principle. Resistance on the discharge side increases with the distance. Short distance produces a — pressure in the pipe (8 in. vacuum by H_2O column). As discharge increases, the vacuum falls. A preheater consists of a 3 in. cast-Fe soil pipe, 6 lengths rusted into a header at either end and placed beneath the hearth in the path of waste gases. 35% saving results from preheating the air to 334°. Powdered coal needs watching, but temp. regulation is easy. It burns best with about 200 cu. ft. of air per lb. An exptl. boiler is described and illustrated. The fire is kindled in one burner and the others catch in turn. Load is obtained in 20 min. for a cold furnace. The air vol. may be reduced by changing its points of contact, causing a rise in flue temp., with no smoke. CO_2 is judged from air vols. instead of by analysis. Flue gases heat H_2O pipes. The main difficulties in burning powdered coal, increasing with quantities and temps., are: slag, ash and burned brick work. Ash slags when hot and is drawn off at intervals. With heavy loads, slag particles travel with the gas currents and cling to the bottom row of tubes. They are blown off with a steam jet twice daily. Soot contg. 60% C is a loss. Costs are given and repairs claimed to be nominal. Radiation from the furnace is small, as it is surrounded with preheating air passages. W. H. BOYNTON.

Differences in the acceleration of the Kjeldahl digestion of coal and coke. B. M. MARGOSCHES AND ALFRED LANG. Brunn. *Chem. Ztg.* **39**, 673–5(1915).—Results are given of work on various coals, sucrose, cellulose, casein and the cokes from these materials, and also petroleum coke and various graphites. The time required for treating these, with the addition of CuO, HgO, CeO_2, V_2O_5, WO_3 and K_2SO_4, alone and mixed, or in the form of asbestos impregnated with the oxides, is given. The results show that, while HgO alone gives good results with the original substances, the addition of WO_3 (in the form of asbestos impregnated with 2 pts. WO_3), alone, or better with HgO, is advantageous in the case of hard cokes, the time required being reduced to less than 2 hrs., as a rule. J. H. MOORE.

Occurrence and composition of natural gas. NIEDERSTADT. *Z. öffent. Chem.* **20**, 386–8(1914).—Comparison of the compn. of natural gases throughout the world shows that the gas consists principally of methane and its homologs, the amt. of unsatd. hydrocarbons rarely exceeding 1%. CO is not present and many gases are free from CO_2. A gas obtained from a deep boring in Pechelbronn, Alsace, contained 47.75 CO_2, 46.17 N_2, 5.65 CH_4, 0.1 O_2, and 0.38% He. H. A. PIPER.

Recovering and treating industrial smoke and gas. Smoke filter. A. GAUTIER. *Bull. Soc. Chem.* **17**, 273–8(1915).—G. calls attention to the fact that suspended particles in factory smoke are an important factor in the pollution of the air of industrial cities. An app. (see fig. 1) is described for collecting and weighing these particles. An av. sample of flue gas is obtained by means of the tube *A*. The gases are aspirated through the openings *a*, *a*, and into the tube *B* through *b*. The gases are cooled and

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washed in *D* by bubbling through water and glass balls. From *G* they enter the filter *K* which is formed of 2 Pt cones firmly held together by a frame; between them is stretched the filtering medium, formed of 3 sheets of Berzelius filter paper of equal weight. A thermometer is attached to *K*, and the rod *v* is heated by a bunsen burner

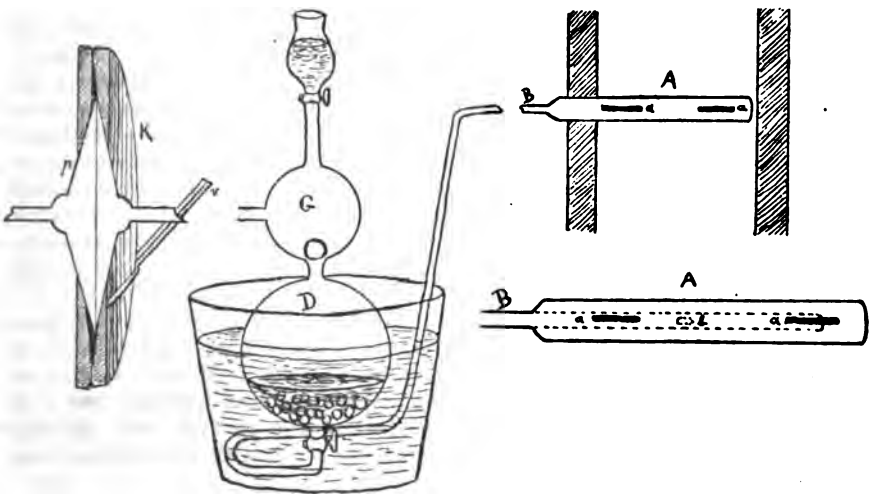

Fig. 1.

to maintain the temp. at 100° to prevent condensation of steam in the pores of the paper. An ordinary vacuum pump followed by a gas meter can be used as an aspirator. After an expt., the 3 papers are folded like an ordinary filter, and used to filter the contents of *D*. The papers are then sepd., dried and weighed; the first one should have collected all the particles, the second one stops any minute particles which may have escaped, the last one is used as a counterweight. For soft coal the av. wt. of solids per cu. m. of flue gas is 0.003 g. **Aspirating gas tank of uniform rate of flow.** *Ibid* 297–301.—The app. (see fig. 2) is used either for collecting av. samples of gases or for drawing them through reagents for analytical purposes. The gas tank consists of a steel cylinder closed at either end with hemispherical caps and equipped with a Hg manometer and a special stopcock. To collect a sample of gas a vacuum is produced in the tank which is then put in communication with the source of gas. In order to obtain an av. sample in a definite interval of time, a uniform flow of gas is necessary; this is obtained by means of the graduated stopcock *F* leading to the tube *C*, 1 meter long; the extremity of *C* is immersed in a Hg bath, and has a slit *D* 760 mm. long. The extremity of the glass tube *E* is also immersed in the Hg bath. *S* communicates with the tank. When a vacuum is produced in the tank, the Hg in *E* is drawn very nearly to the top of the slit; on opening the stopcock, the inlet for the gas is very small, but as the pressure decreases in the tank, the Hg drops, and the inlet for the gas is progressively enlarged. A very uniform flow of gas is obtained. **Mixtures of air, CO, CO_2, SO_2, H_2O, H_2, C_2H_2, C_2H_4, CH_4 etc.** *Ibid* 301–6.—G. describes in detail a new

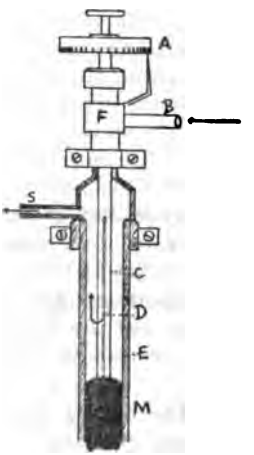

Fig. 2.

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method for analyzing industrial gases, and gives an example of analysis of blast furnace gas. By means of his aspirating gas tank (cf. above) an av. sample of gas is drawn through his gas filter then cooked in a metal tube and passed through sulfuric pumice. Next it is drawn through a KOH absorber for CO_2, SO_2, H_2S, HCl; if O is present a spiral absorber (*Bull. soc. chim.* [3] 23, 141) containing a concd. soln. of $Na_2S_2O_4$ (*Bull. soc. chim.* [3] 19, 152) and followed by a KOH tube is used. The absorption app. is weighed after an expt. and the corresponding vols. of CO_2 and O_2 calcd. If SO_2 and H_2S are present the former is titrated in the alk. soln. with I; H_2S is liberated with H_2SO_4 and carried into a standard soln. of $AgNO_3$ by means of a current of CO_2, and the excess of $AgNO_3$ titrated. By means of a suction pump a portion of the contents of the tank is passed through the following reagents: a tube containing sulfuric pumice; a spiral absorber containing a $C_2H_4O_2$ soln. of BrI to absorb the unsatd. hydrocarbons; a gas washer containing HgI_4K_2; a U-tube heated to 80–100° containing I_2O_5 followed by a column containing reduced Cu, a Liebig KOH bulb, and a column of soda-lime. The increase in wt. of the 2 last app. × 0.636 = CO. Next in order comes a small combustion app. for analyzing the satd. hydrocarbons and free H. N = the difference between the total vol. of gas extd. from the tank, and the sum of the gases analyzed. If $Vo°_{760}$ = vol. of gas extd., V the vol. of the tank, h, h' the height of the manometric Hg of the tank before and after extn. $Vo°_{760} = V(h' - h)/760(1 + \alpha t)$; to this vol. should be added those of CO_2, SO_2, and H_2O obtained in the first part of the analysis, and calcd. proportionately to the vol. of gas extd. from the tank. Although the method is open to improvement it is sufficiently accurate for industrial purposes.

P. J. Cole.

Experimental investigation of thermal efficiency of a gas engine. G. Asakava and J. E. Petaval. *Gas World* 63, 263(1915).—At full load, under the most favorable conditions the indicated horse power of a gas engine is 88% of that of an ideal engine working with a similar mixt. For mixts. containing only a slight excess of air the above corresponds to an absolute thermal efficiency of 27% at a compression ratio of 3.75 and 33% at a compression ratio of 5.6. For mixts. containing twice the amt. of air required for complete combustion, the absolute efficiencies are 29 and 36%. The absolute brake efficiency is 21% at a compression ratio 3.75 and 25.5% at a compression ratio 5.6 for mixts. containing little air in excess, and 23% and 27%, resp., for mixts. containing twice the amt. of air required for complete combustion. The max. brake efficiency obtained in these expts. was 27.4%; it occurred at the highest compression ratio for a mixt. slightly stronger than this. The mechanical losses were 6.5 h. p. at no load and 7.0 h. p. at full load at compression ratio of 5.6. M. L. Trowbridge.

By-product ovens for American gasworks. Anon. *Gas World* 63, No. 1624; *Coking and By-Products Section* 18–9(1915).—A description of the new plant of the Laclede Gas Light Co. at St. Louis. E. H.

American coking practice up to date. C. S. Lomax. *Gas World* 63, No. 1620; *Coking and By-Product Section* 19–20(1915).—A paper read before the Pittsburg Foundrymen's Assoc. L. gives a general discussion of the working of by-product ovens.

M. L. Trowbridge.

The heating and nitrogen problems after the war. P. W. Uhlmann. *Chem. Ztg.* 39, 713–5(1915).—In order to conserve the fuel deposits and make Germany more independent of foreign countries U. advocates a chain of centralized coking plants from which the gas may be distributed to consumers, or in which steam or elec. power may be generated and distributed, any excess of elec. power being used for the fixation of atmospheric N. The coke, alone or mixed with briquets, would replace the present use of coal; the $(NH_4)_2SO_4$ would replace imported $NaNO_3$ for fertilizer, while the tar-oils and benzole would supply motor-fuel, etc. J. H. M.

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Waste-heat boilers in steel plants (BACON) 9. Determination of toluene in commercial toluoles (NORTHALL-LAURIE) 7.

U. S., 1,153,417 Sept. 14. G. H. BENTLEY. **Apparatus for making producer gas,** and grate operating mechanism for same.

U. S., 1,153,506, Sept. 14. O. D. LUCAS. **Apparatus for making producer gas,** *e. g.*, from peat.

U. S., 1,153,623, Sept. 14. E. A. W. JEFFERIES. **Gas-producer** (ash-hopper construction, etc.).

U. S., 1,154,455, Sept. 21. H. STRACHE. **Water gas and distillation gases** are produced by hot-blasting coal in a distn. chamber and the distn. gases produced are allowed to accumulate in the chamber while its outlet valve is closed; then water gas is formed by steam-blasting from below and the distn. gases are displaced from the chamber by the water gas and are led off through the outlet. The outlet is kept open during the first part of a succeeding hot-blasting until the water gas has been displaced by another portion of distn. gases. These 2 stages are repeated alternately. Cf. *C. A.* 9, 2307.

Brit., 12,257, May 18, 1914. J. M. RUSBY. In the construction of **liquid and gaseous fuel furnaces,** to prevent intense local heating and to distribute the heat in chambers containing retorts heated by liquid or gaseous fuel, the burning mixt. of air and producer gas, etc. is agitated or circulated by means of fluid jets of steam, air, or combustion products, which are injected into the retort chamber at various heights across the line of travel of the combustion products so as to mix the fluid combustible and air with the hot products of combustion.

Brit., 12,267, May 18, 1914. H. A. FREDERICK. **Constructional details of an app. for carburetting air.**

Brit., 12,463, May 20, 1914. C. J. O'DONNELL and A. F. KUNBERGER. **Purifying coal and like gas.** See U. S., 1,105,578 (*C. A.* 8, 3233).

Brit., 12,640, May 22, 1914. E. ENKE. **Preventing smoke in furnaces** by drawing the hot gases from the fire-chamber by means of highly heated air issuing from nozzles arranged so as to form a screen above the fire-bridge.

Brit., 12,818, May 25, 1914. OTTO & Co. In a process of **separating tar and ammonia from gas,** wherein the gas is passed into direct contact with H_2O flowing in the opposite direction, the washing H_2O is withdrawn from the middle part of the washer, where its NH_3 content is highest, at such a rate that the amt. of NH_3 withdrawn in a given time is the same as that introduced during that time by the crude gas.

Brit., 12,877, May 26, 1914. E. L. PEASE. **The heat-absorbing walls of furnaces** and app. for transferring and utilizing the heat of combustion are composed of gilled metal tubes imbedded in, or packed externally with, firebrick or other refractory material, which is sandwiched between the gill plates.

Brit., 13,160, May 28, 1914. SOC. L'AIR LIQUIDE (SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE). Process and app. for **separating the constituents of gaseous mixtures** which liquefy at very different temps., in particular the sepn. of CO and H from water gas, of the kind in which the water gas is passed through heat-exchangers.

Can., 164,087, Aug. 3, 1915. F. R. WATT and B. WALLIS. **Composition of matter for destroying soot,** consisting of coke breeze, KNO_3 and Zn shavings.

Can., 164,103, Aug. 3, 1915. L. P. BURROWS. **Process for treating coal and other substances** which comprizes first suddenly expanding steam, sepg. the steam without

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condensation from any water held in suspension, then heating the gaseous product to a high temp. and subjecting coal or other substances to the action of the resultant gas in a chamber from which air is excluded.

Can., 164,595, Aug. 31, 1915. T. RIGBY. **Process for dehydrating peat** by acidifying the wet peat, heating while wet and without evapn. only until the material loses its water-binding properties and then expressing the liberated water. Cf. *C. A.* 9, 369.

Can., 164,615, Aug. 31, 1915. J. G. AARTS. **Process of purifying gases and recovering the by-products** by heating a washing and pptg. liquor by means of the gases, causing the gases to be cooled and condensed by the gas previously circulated and to be partly reheated by the gases subsequently circulated, mixing the gases with the heated washing and pptg. liquor and thereafter discharging the mixt. into a separation vessel.

Ger., 275,106, June 8, 1912. Addition to 275,084. SIEMENS & HALSKE AKT.-GES. In the **quantitative analysis of gas mixtures** with known constituents, the process of the principal patent 275,084 is applied here for regulating the reactions chemically or chem.-technically, and, indeed, chem. reactions wherein gaseous products result are regulated by analyzing the gaseous reaction products, in an analyzer, by a mechanical process with the aid of centrifugation, and transmitting the result by means of an indicator to an app. for the automatic regulation of those reaction processes, by means of which the gaseous products are formed. *E. g.*, the gas mixt. is conducted through the analyzer, the indicating device of which is disposed between 2 elec. contacts. Relays are arranged in a circuit, the action of which effects the desired regulation. This process is applicable, *e. g.*, in the production of illuminating or generator gas of a definite composition. The analysis of flue gases can be used for the automatic regulation of the charging of the blast furnace. In the production of N oxides in the elec. arc, the elec. energy or the blast can be regulated by the analysis of the resulting nitrous gas mixt.

Ger., 278,676, July 3, 1913. Addition to 275,084. SIEMENS & HALSKE. **Constructional modifications of the app. for the quantitative analysis of gas mixtures** with known constituents, employing a comparison gas which is centrifuged with the same speed, both gases being maintained at the same temp. and pressure.

22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

Contribution to the investigation and valuation of the illuminating petroleums. ROB. JUNGKUNZ. *Chem. Ztg.* 39, 641–2, 659–61(1915).—Results of tests, including fractional distns., on American, Bohemian, Galician, German, Roumanian and Russian common and safety illuminating oils. A partly successful scheme has been worked out for detg. the source of the oil. A brief bibliography is given. J. H. MOORE.

The estimation of aromatic hydrocarbons in cracked petroleum. W. F. RITTMAN, T. J. TWOMEY AND G. EGLOFF. *Met. Chem. Eng.* 13, 682–6(1915).—The authors conclude from their expts. that soly. methods are not satisfactory, that the freezing method for detg. C_6H_6 is at best only qual. Results approximating those of the best chem. methods are obtained by the following: distil 700 g. cracked oil from a 1 l. flask with a 5 in. Hempel column filled with Al beads. Make a cut at 175° and redistil this fraction, making fractions at 105°, 130° and 160°. Again redistil, fractionating at 95°, 120° and 150°. These fractions contain C_6H_6, C_7H_8 and the xylenes. From their sp. gr. the amts. of aromatic hydrocarbons are calcd. assuming for the sp.

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gr. of the non-aromatic portion 0.72, 0.73 and 0.76, resp. This method is compared with the nitration method, which gives results 1.4% to 3.9% lower. F. M. ROGERS.

Important topping plants of California. A. F. L. BELL. *Bull. Am. Inst. Mining Eng.* 1915, 1769–99.—Detailed descriptions with numerous illustrations, statistical data, etc. F. W. SMITHER.

Fire-proof storage of benzine. H. STRACHE. *Z. Ver. Gas Wasserfachm.* 55, 191–200, 209–22(1915).—An illustrated description of various app. now manufactured for this purpose. V. NUNEZ.

The shell oil pipe line. H. W. CROZIER. *J. Elec. Power and Gas* 35, 161–78 (1915).—Complete details are given of the methods of constructing a 170 mile oil pipe line with 11 pumping stations. The total cost was approx. $4,000,000. Specifications for compn. and mechanical properties of the pipe used are given. The trenching, pipe screwing, cleaning and priming, lowering and back-filling were all done by machine. The article is well illustrated. W. E. RUDER.

Chemistry of asphalt, especially photochemical properties. P. GÖDRICH. *Monatsh.* 36, 535–48(1915).—In the reaction of asphalt with S_2Cl_2 there is a combination of substitution and addition reactions. In asphalt satd. linkings predominate and thus the substitution process also predominates. There is present a part which does not react with S_2Cl_2, which contains a smaller S content and has a higher I no. than does the orignal material. In the action of light upon asphalt, which makes it more insol., O plays the role of a catalyzer. By the action of S_2Cl_2 upon asphalt the light sensibility is increased, but this is not proportional to the % of S in the different varieties. Solns. of asphalt show absorption bands in the blue and the yellow; in the asphalts contg. S the latter are lacking. Asphalt is sensitive towards monochromatic light for the entire range of the spectrum and into the ultraviolet. As far as its sensibility towards light is concerned, crude Cuba-Jatibonico asphalt may replace Syrian asphalt. C. J. WEST.

The problem of making alcohol from wood. ERIK HÄGGLUND. *J. prakt. Chem.* 91, 358–64(1915).—Of the many methods proposed for making alc. from wood and other cellulose materials, nearly all have been abandoned, either because the sugars obtained on hydrolysis are largely the pentoses and therefore not convertible to alc., or because of the cost of the hydrolyzing agents (H_2SO_4, H_2SO_3, HCl, etc.). In general, very dil. acids or only small amts. of concd. acids should be used and the vols. of the solns. kept down to the minimum, since distn. costs are large items of expense. In expts. with pine and fir sawdust, using 0.4–1% H_2SO_4, with an acid-wood ratio of 1.3 to 4.8, at the optimum temp. of 175°, H. got a max. yield of 85 l. alc. per ton. Using H_2SO_3 of varying concns. the max. yield was 43 l., with $CaH_2(SO_3)_2$ 65 l., with concd. HCl 70 l. and with 100 g. 70% H_2SO_4 per 100 g. dry wood, from 80 to 158 l. H. L. OLIN.

Detection of benzene in mixtures (FRANK) 7.

U. S., 1,154,516, Sept. 21. E. D. KENDALL. **Refining petroleum distillates or other hydrocarbon oils.** H_2SO_4 is mixed with the oil to be refined and the mixt. is spread upon balls of glass, porcelain or stoneware which are tumbled in rotating drums. The oil and acid may be supplied continuously and fresh acid is also supplied to mix with the partially treated oil which passes from the settling tank to the second treatment chamber.

U. S., 1,154,517, Sept. 21. E. D. KENDALL. **Apparatus for refining oils** according to the process of the preceding pat.

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Brit., 12,653, May 22, 1914. E. A. VALFY and O. D. LUCAS. **In cracking oil,** the oil is vaporized in a still by introducing steam under pressure or an inert gas through a perforated pipe, and the resulting vapors are led by a pipe into contact with a heated catalyst contained, *e. g.*, in tubes, the pressure of the mixt. on its exit from the tubes being reduced by a pump. Preferably, a sudden reduction of pressure is effected by means of throttle valves fitted at the ends of the tubes. Ni or other metal or alloy in a porous condition, or a metallic oxide or suboxide, are employed as catalysts. The inert gases employed consist of the uncondensable gases resulting from the cracking operation. In an example, the temps. in the still and the cracking tubes are 360° and 500–600°, resp.; the pressure of the gas admitted to the still is 5 lbs., and the reduction in pressure after cracking is 6 lbs. The still and cracking tubes are heated at the beginning of the operation by means of auxiliary burners, and afterwards by a burner using the surplus gases resulting from the operation. The cracking tubes are fitted with cut-out valves. The vapors leaving the cracking tubes pass through a heating coil in the still, then through a pipe to a preheater containing oil on its way to the still, and finally to a dephlegmator. The dephlegmator contains trays, some of which are fitted with cooling coils. Sep. fractions flow away through pipes to coils in a cooling tank; the uncondensed vapors and gases pass by a pipe to coils in a cooling tank. Uncondensed gases escape by pipes and are led by a suitable pipe to an absorbing tank containing petrol. The unabsorbed gases pass by a pipe to the pressure reducing pump. Cf. *C. A.* 9, 711.

23. CELLULOSE AND PAPER.

A. D. LITTLE.

Hydrocellulose. O. HAUSER AND H. HERZFELD. Univ. Berlin. *Chem. Ztg.* 39, 689–90(1915).—Work is described which lead the authors to conclude that hydrocellulose is not a uniform compd., but contains an absorbed subst. which may be extd. and in which they have detected grape sugar. Cf. *C. A.* 2, 184, 704, 1043, 1882; 3, 1013, 1108, 1457, 1811; 4, 1369; 5, 1187, 1677, 3153; 6, 545; 7, 2303; 8, 1009.

J. H. MOORE.

Eliminating pitch and fat from cellulose. R. SIEBER. *Paper* 16, No. 21, 13–4 (1915).—Of the total ether-sol. pitch present in wood, the sulfite cooking process removed but 4.2% (av. of 5 tests). S.'s deresinating treatment removed an additional 51.8% and the bleaching process (hypochlorite) 15%, so that 29% of the original pitch of the wood remained in the bleached pulp. This amounted to 0.35% on the wt. of the pulp. Pitch deposits from the sand-traps were almost entirely sol. in ether and consisted of approx. equal parts of rosin and of fat. The fat is considered as the chief cause of trouble in the paper mill.

V. NUNEZ.

Importance of viscosity in the chemistry of celluloid in theory and practice. H. SCHWARTZ. *Mon. sci.* 5, 49–57(1915).—The manner in which the viscosity of celluloid and of other nitrocellulose solns. is affected by a number of variables governing the condition and compn. of the solns. is dealt with. These changes are of the greatest practical significance and are doubtless closely bound up with the size of the nitrocellulose mol. Viscosity studies promise to throw light on the nature of the cellulose mol.

V. NUNEZ.

Notes on acid systems. LEO. SCHLICK. *Pulp Paper Mag. Can.* 13, 198–201, 227–9, 257–62(1915).—Notes on this phase of sulfite pulp manufacture. V. N.

The manufacture of high grade sulfite pulp. L. WIMMER. *Pulp Paper Mag. Can.* 13, 456–8, 481–2(1915).—Hints and practical considerations. V. NUNEZ.

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Cooking pulp with exhaust steam. C. F. HOLMBOE. *Papier Fabr.* 13, 501–4 (1915). V. NUNEZ.

Standardization and control of mill process. OTTO KRESS. *Paper* 17, No. 1, 11–2(1915).—A committee for standardization of methods in paper chemistry is urged. V. NUNEZ.

Electrolytic bleach plants for paper mills. F. G. WHEELER. *Paper* 16, No. 26, 11–2(1915).—General considerations governing economy of installation and operation. V. NUNEZ.

Erasing capacity of tub-sized stock. H. A. MADDOX. *Pulp Paper Mag. Can.* 13, 233–4(1915).—The ability of a writing paper to withstand erasure depends largely on the extent to which the gelatin soln. penetrates the sheet during the sizing process. Any condition adversely affecting penetration, *e. g.*, engine sizing with rosin or rapid drying of the sized sheet, injures the erasing qualities of the sheet. V. NUNEZ.

Partial substitution of sodium hydrogen sulfate for alum (in sizing). ANON. *Papier Ztg.* 40, 890(1015).—Perfect sizing may be obtained using half the usual amt. of alum and substituting for the remaining 50% alum 20% $NaHSO_4$. V. NUNEZ.

Beating and hydration. F. CYSTER. *Paper* 16, No. 22, 13–4(1915).—A brief discussion of well-known phenomena. The suggestion is made that a Mullen tester may be converted into a slowness tester by removing the diaphragm, filling the glycerol chamber with the pulp under test and detg. the pressure required to drive the water from the pulp, out through a wire gauze. V. NUNEZ.

French paper-making school at Grenoble. M. BARBILLION. *Pulp Paper Mag. Can.* 13, 431–2(1915).—A brief description. V. NUNEZ.

Requirements of ledger and bond papers. H. A. MADDOX. *Chem. Eng.* 21, 80–2(1915).—A general discussion, principally of watermark and color. V. N.

Papyrus and paper manufacture. WM. BEAM. Wellcome Trop. Res. Lab., Chem. Section, *Bull.* 2, 4 pp.(1915).—Papyrus, or sudd, is an excellent raw material for paper but too cheap and bulky to permit exportation for this purpose. A half-stuff made by treating sudd with water under pressure at 142 to 150° is easily bleachable after a further mild soda treatment, and is valued at $25.00 per ton. The yield of bleached pulp is about 20% on the dry sudd. V. NUNEZ.

Tabular review of the processes for the manufacture of difficultly combustible celluloid ware. M. SCHALL. *Kunststoffe* 5, 207–9(1915).—Patents. F. W. S.

Graphical method for finding the equivalent weight per ream. E. J. TRIMBEY. *Pulp Paper Mag. Can.* 13, 197–8(1915).—Curves for the detn. of equiv. ream wts. of paper. V. NUNEZ.

U. S., 1,153,596, Sept. 14. E. BRONNERT. **Celluloid-like material from cellulose formate.** Cellulose formates are pptd. as a slimy mass from soln. in formic acid by treatment with amyl acetate, MeOH or toluene and EtOH and after sepg. the liquid from the mass it is kneaded with a solid H_2O-insol. solvent such as camphor.

U. S., 1,153,834, Sept. 14. B. M. E. L. P. VON EHRENTHAL. **Obtaining cellulose from fibrous material** such as tough resinous or gummy fibers which are difficult to "open out." The material is boiled with a weakly acid sulfite soln. under 5–6 atm. pressure at 125–130° or less and then mechanically disintegrated and washed, digested with NaOH under atm. pressure at about 80–90° and washed.

U. S., 1,153,883, Sept. 21. H. ARLEDTER. **Semi-liquid paper pulp** is prepd. by beating or disintegrating the raw material, in a closed chamber while alternately subjected to pressure and vacuum, and at the same time bleaching, sizing or coloring materials are added as required.

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U. S., 1,153,892, Sept. 21. N. H. CARPENTER. **Paper-making machine.**

U. S., 1,153,934, Sept. 21. T. LEE and A. B. MONKS. **Lixiviated sugar cane is prepared for making paper** pulp by disintegrating and drying the fibrous tissue, and digesting it in a soln. containing NaCl and NaOH (prepd. by electrolysis of NaCl soln.). The wax is recovered from the soln. by boiling down, skimming off the alk. compds. of the wax, dissolving them in alc., neutralizing and pptg. with H_2O.

Brit., 13,055, May 27, 1914. COURTAULDS, LTD., W. H. GLOVER and L. P. WILSON. In the production of **alkali-cellulose,** the action of the alkali is increased and the time of maturing decreased, by subjecting it to oxidation by O or other suitable oxidizing agent. In examples, wood pulp is treated with NaOH soln. containing Na_2O_2; alkali-cellulose prepd. in the usual way from wood pulp is placed in a jacketed vessel, and a steady current of air blown through the mass. H_2O_2, hypochlorite, or permanganate are other suitable oxidizing agents. The alkali-cellulose is afterwards used in the manuf. of other cellulose compds. Thus, the product obtained according to the 2nd example, after cooling, may be treated with CS_2, and the viscose so prepd. used in the manuf. of artificial silk.

24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

Inflammable limits of mixtures of gasoline vapor and air. G. A. BURRELL AND H. T. BOYD. Dept. Int., Bur. Mines, *Tech. Paper* 115, 16 pp.(1915); see *C. A.* 9, 1844. E. H.

U. S., 1,153,525, Sept. 14. M. SHADID. **An ignition composition for matches** is formed of gum arabic 10, $K_2Cr_2O_7$ 1.75, Sb_2S_3 1.5, crushed glass 3, coal dust 1.25, $KClO_3$ 3 and S 0.5 parts.

Brit., 13,138, May 28, 1914. D. J. METCALFE, A. C. PEARCY and CURTIS'S & HARVEY. Mfg. **explosives** by mixing together the following ingredients, substantially in the proportions specified: NH_4NO_3 60, nitroglycerin 9.5, collodion cotton 0.5, starch 4, NaCl 15, $(NH_4OCO)_2$ 10, and castor oil 1.

Can., 164,317, Aug. 17, 1915. R. WEYEL. **Separation of a mixture of liquids containing nitroglycerin and an acid.** See U. S., 1,138,917 (*C. A.* 9, 1692).

Can., 164,444, Aug. 24, 1915. R. WEYEL. **Separation of a mixture of liquids containing nitroglycerin and an acid.** See U. S., 1,138,916 (*C. A.* 9, 1692).

Can., 164,792, Sept. 7, 1915. W. H. MAWDSLEY. **Compositions for use with explosives for neutralizing noxious fumes** consisting of a combination of a nitroglycerin explosive and a soln. of an alkali hydroxide or oxide.

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Use of the flaming arc in paint and dye testing. W. R. MOTT. *Trans. Am. Electrochem. Soc.* 28 (advance copy); *Chem. Eng.* 22, 111–21(1915).—The white-flame arc at 25 amps. gives light at 2 ft. more intense than summer sunlight and it is constant. A 5000 mean spherical c. p. white-flame arc gives a spectrum like sunlight; the c. p. is exceptional in size of unit available; the efficiency is greater than in the case of other forms of illumination. For equal amts. of elec. energy, the photographic power of the white flame arc is 6–10 times greater than that of a N-filled incandescent lamp. Different flame carbons are used for testing different colors, with the snow-

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white flame-C best for fading tests. The white-flame-C saves much time. Fading is marked in the use of dil. dyes. In paints, chrome yellow turns green; lithopone darkens unless the heat of the lamp allows oxidation of the metallic Zn film. A good bibliography and several tables of comparisons are given. W. H. BOYNTON.

The lithographic printing of textile fabrics. R. B. FISHENDEN. *J. Soc. Dyers Colourists* 31, 130–33(1915).—Lithographic printing of textile fabrics is quite different from all common methods of printing. It has been used with considerable success in printing handkerchiefs and similar goods from flat surfaces but the employment of thin metal plates instead of stone has made the so-called rotary machines practical. The Hayes process is described with illustrations of machine and sample of printed cloth. L. A. OLNEY.

Schreiner engraving. ROBERT LAING. *J. Soc. Dyers Colourists* 31, 116–9(1915).—Detailed description of method of engraving steel rolls for Schreiner finish, illustrated with 7 photomicrographs. L. A. OLNEY.

Innovations in the chemical technology of the textiles. RICHARD LOEWENTHAL. *Chem. Ztg.* 39, 669–70, 695–8(1915).—A general review, with bibliography. J. H. MOORE.

Testing and properties of textile materials. ANON. *Circ. Bur. Standards* No. 41, 2nd edition, 26 pp.(1915).—This edition contains an appendix to the former paper (cf. *C. A.* 7, 1614, 2311) giving results in tabular form of tests on fabrics used in the manufacture of cotton bags (for sugar, salt, seeds and cement); common tying twines of cotton and of jute; 17 other common fabrics of linen, cotton or jute; and a table showing the adulterations of 17 common wool, linen, or silk fabrics or twines. Expts. proved that the tensile strengths of cotton yarns at 70 increased 16% for a 40% increase in humidity, while worsted yarns lost 18% in tensile strength under the same conditions. The results are illustrated by curves. L. W. RIGGS.

Copper values and tendering of cotton by some organic acids in steaming. G. E. PILKINGTON. *J. Soc. Dyers Colourists* 31, 149–53(1915).—The effects of tartaric, oxalic and citric acids on the hydrolysis of cellulose were detd. under varying conditions by use of Schwalbe's method, modified in that the Cu was estd. in the filtrate after boiling with Fehling soln. the amt. pptd. being detd. by difference, instead of by direct electrolytic detn. of Cu in the pptd. copper oxide. It was found that cotton cloth treated with 5 g. tartaric acid per 100 cc., when dried and steamed, gave a Cu value of 4.80; by adding 1.6 g. Glauber's salt the Cu value was reduced to 2.82, thus showing that the effect of Glauber's salt is to prevent hydrolysis. With tartaric acid and citric acid no tendering of cloth can be detected and only slight of hydrolysis is indicated by Cu values when Glauber's salt is increased to 20 g. P. thought before starting expts. that Na_2SO_4 would increase the tendering owing to decompn. by organic acid and liberation of mineral acid. According to Arndt a soln. of Na_2SO_4 has an alk. reaction at the boil and if so this may account for present action. Oxalic acid has more tendering action than tartaric or citric, even as low as 0.5 g. in 100 cc. giving a Cu value of 5.75, whereas the same amt. of tartaric gives 2.52 and citric 2.63. Neither HCO_2H nor AcOH alone or in the presence of Glauber's salt seems to have an appreciable effect upon cotton as to tendering or Cu value. In no case did the acids tender cotton when simply dried on the fiber even in the case of oxalic. L. A. OLNEY.

The influence of neutral salts on the tendering of cotton with acids. M. FORT. *J. Soc. Dyers Colourists* 31, 165–7(1915); cf. preceding abstr.—Certain apparent objections to the method of P. led F. to try heating cotton under reflex condenser with a soln. containing 2% oxalic acid and 20% Na_2SO_4 for 1 hr. in a boiling bath. Tensile strength detns. were: blank test with water 11.06 oz., 2% oxalic acid 6.71 oz., and 2% oxalic acid + 20% Na_2SO_4 9.84 oz. NaCl along with HCl makes the latter tender

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the cotton much less. F. discusses correlation of Pilkington's results with the work of Arrhenius on sugar inversion and concludes that results of P.'s expts. are too complicated to admit of theoretical interpretation without further work, which he hopes to carry out later. L. A. OLNEY.

The action of mineral acids upon cotton. MANASSEH COHEN. *J. Soc. Dyers Colourists* **31**, 162–5(1915).—Investigation with the object of detg. at what concn. tendering of cotton begins (*a*) when boiled in acid soln., (*b*) when, after being thoroughly immersed in acid soln., it is heated to 120° for 10 min.; also the quant. detn. of comparative action of HCl and H_2SO_4. On boiling for 1 hr. with HCl of 1/128%, the copper equiv. of cotton (Schwalbe, *J. Soc. Chem. Ind.* **26**, 548(1907)) is increased; H_2SO_4 produces no appreciable change in the equiv. until 1/32% concn. is reached. When satd. with cold acid and dried 10 min. at 120°, acid as dil. as 1/400% in case of HCl and 1/128% in case of H_2SO_4 affects the cotton. The increase in Cu equiv. corresponds to decrease in tensile strength. L. A. OLNEY.

Rate of desizing of cotton cloth. J. R. APPLEYARD AND R. C. JEFFERSON. *J. Soc. Dyers Colourists* **31**, 153–4(1915).—Small pieces of gray calico which had been very carefully sized, were dried to const. wt. and then immersed in different concns. of H_2SO_4, HCl and diastafor at different temps. for 1/2 hr., then squeezed, dried, weighed and process repeated 4 times. More than 75% of size in most cases is removed during first half hr. Eight tables are given showing effects of washing and rubbing, rate of extn. and % of size removed. L. A. OLNEY.

Note on the influence of magnesium and zinc chlorides on the tendering of cloth during singeing. WM. THOMSON. *J. Soc. Dyers Colourists* **31**, 133–4(1915).—T. found that cloth containing either $MgCl_2$ or $ZnCl_2$ alone was tendered during singeing but that when cloth contained a mixt. of the two there was much less danger of damage during singeing. L. A. OLNEY.

Determination of toluene in commercial toluoles (NORTHALL-LAURIE) 7. A new pyrrole dye (CHELINTZEV) 10.

U. S., 1,153,555, Sept. 14. H. LEVINSTEIN and J. BADDILEY. **An azo dye** is made by combining *m*-aminobenzoyl-*p*-phenylenediamine with 2 mol. proportions of resorcinol. It dyes cotton bright orange which on treatment with CH_2O becomes redder and is fast to soap and cross-dyeing. Similar dyes are obtained by combining *m*-aminobenzoyl-*p*-phenylenediaminesulfonic acid or *m*-aminobenzoyl-1,4-naphthalenediamine-6-sulfonic acid with resorcinol.

U. S., 1,154,174, Sept. 21. E. BUTTE. **A composition for weighting silk** is formed of Na_2CO_3 1 lb., HCl 8 oz., sugar 6 oz., H_2SO_4 2.5 tablespoonfuls, and H_2O 1 pint.

Brit., 12,237, May 18, 1914. AKT.-GES. FÜR ANILIN-FABRIKATION. **Dianthraquinonylthioureas** are prepd. by heating 3-aminobenzoyl-*o*-benzoic thioureide or its substituted derivs. with strong or fuming H_2SO_4. The product from 3-amino-4-methylbenzoyl-*o*-benzoic thioureide is a vat dye. **3-Aminobenzoyl-*o*-benzoic thioureides** are prepd. by boiling the corresponding acids with CS_2.

Brit., 12,239, May 18, 1914. FARBW. v. M. L. & B. In the manuf. of **dyes**, the halogenized or nitrated derivs. of the oxazole obtained from β-aminoalizarin and BzCl are condensed with primary aromatic amines; the condensation products, on sulfonation, yield acid wool dyes. According to an example, the oxazole is nitrated with 1 mol. part of HNO_3, the nitro deriv. is condensed with aniline or *p*-toluidine, and the products are sulfonated by means of a mixt. of concd. and fuming H_2SO_4; the sulfonic acids dye wool violet shades, becoming green on chroming.

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Brit., 12,374, May 19, 1914. G. Diesser. **In rendering silk suitable for felting,** the sericin is removed by known methods and the silk is treated with HCOOH until uniform fiber pulp is produced when the mass is strained and dried. Fibroin soln. in HCOOH glues the fibers together, and a tough paper-like mass is produced, which may be felted together according to well known methods.

Brit., 12,559, May 21, 1914. Heberlein & Co. **Finishing cotton fabrics,** to impart to them a wool-like effect, by treating mercerized and preferably bleached fabric with H_2SO_4 of 49–51° Bé. Pattern effects may be produced by printing mercerized cotton fabric with H_2SO_4 of the above strength and then washing, or by printing a reserve, such as gum thickening, on the fabric, treating with the acid, and then washing.

Brit., 12,644, May 22, 1914. Akt.-Ges. für Anilin-Fabrikation. **Dyeing skins, hairs,** etc., in gray shades, by treatment with a bath containing a salt of a *p*-dimethylaminodiphenylamine deriv. containing in *p'*-position a substituent such as an NH_2, NMe_2, NEt_2, or OH group, or a deriv. of such a base, and an oxidizing agent such as H_2O_2. The skins, etc., may be previously mordanted with Fe, Cr or Al mordants. Cf. *C. A.* **9**, 1124.

Brit., 12,819, May 25, 1914. Farbw. v. M. L. & B. **Wool dyes,** similar to those described in 12,239 (*supra*) are obtained by first nitrating or halogenizing and then condensing with aromatic amines, the sulfonic acids or substitution products of the oxazole derived from β-aminoalizarin and BzCl, or oxazines containing one or more aryl groups and derived from β-aminoalizarin. According to examples: the oxazole from β-aminoalizarin and BzCl is successively sulfonated, nitrated, and condensed with *p*-toluidine; the oxazole from *o*-ClC_6H_4COCl and β-aminoalizarin is successively nitrated, condensed with *p*-toluidine, and sulfonated; a similar product is obtained from the oxazole derived from 2,4-$(NO_2)_2C_6H_3COCl$ and β-aminoalizarin; the oxazine obtained by condensing β-aminoalizarin with benzoin is successively nitrated, condensed with *p*-toluidine, and sulfonated; the oxazine obtained from β-aminoalizarin and bromoacetophenone is treated similarly.

Brit., 12,820, May 25, 1914. Chem. Fabrik Griesheim Elektron. **Monoazo and disazo dyes** are obtained by combining diazo, diazoazo, or tetraazo compds., containing no SO_3H or CO_2H group, with 2-acylamino-3-naphthols; the dyes may be prepd. in substance or on the fiber. Suitable diazo compds. are those derived from aniline, its homologs or substitution products, such as *o*- or *p*-anisidine, Cl or NO_2 derivs. of toluidine or anisidine from α- or β-naphthylamine, from aminoazo compds., or diamines such as benzidine, tolidine, dianisidine, diaminodiphenylurea, etc. **Lakes** can be prepd. from the azo dyes described in examples. **2-Chlorobenzoylamino-3-naphthol or 2-nitrobenzoylamino-3-naphthol** is obtained by condensing the corresponding acid chlorides with 2,3-aminonaphthol; **2-acetylamino-3-naphthol** is obtained by the reaction of Ac_2O on 2,3-aminonaphthol; **3,3'-dihydroxy-2,2'-dinaphthylurea** is obtained by treating 2,3-aminonaphthol with $COCl_2$.

Brit., 13,005, May 27, 1914. E. V. Chambers, T. C. Hammond and G. G. Jarmain. **Concentrating wool-scouring** and like **liquors,** and recovering grease and alkalies therefrom, by heating foul liquor nearly to the b. p. and subjecting the heated liquor to centrifugal action to sep. the grease and sand therefrom and provide a clear liquor fit for re-use for scouring purposes, the repeated re-use of the liquor and its subjection when foul to centrifugal action concg. the alk. salts to a suitable d. for recovery by incineration. If the scouring liquor should reach too high an alk. concn., while still not sufficiently concd. for incineration, it is treated with washed flue gases. Before being heated, the foul liquor has its contained sand and fibers removed by settling and screening, resp. In the centrifugal separator, the grease is sepd. from the liquor

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and removed from the inner layer or surface by one or more skimming pipes, while the liquor, which forms the next layer, is conveyed back to the scouring machine; the residue of sand left in the liquor forms a third layer against the inner wall of the basket, and is subsequently removed by hand or otherwise.

Brit., 13,129, May 28, 1914. HEBERLEIN & Co. Obtaining **pattern effects on mercerized cotton fabric** or fabric made of mercerized cotton, which are caused by differences of transparency, by printing with concd. H_2SO_4 of over 50.5° Bé., or with a resist, and then passing the fabric through the acid, and afterwards washing. The effect is heightened by subsequent dyeing. Cf. *C. A.* 9, 1396.

Brit., 13,150, May 28, 1914. COURTAULDS, LTD. and W. S. GILLES. In the manuf. of **crepe** and like crimped or embossed fabric from cotton or from art. silk, the material is first treated, to render the crimping capable of resisting moisture, with a soln. of a salt of Al, preferably the acetate, dried and heated to decompose the acetate and then treated with a sol. oil or soap as a softening agent. The material is then exposed to a damp atm. for 24 hrs. or longer, then biassed and crimped as is customary for mourning crepe, debiassed, and rolled on a cylinder. The crepe is then sprayed on one or both sides with a soln. of shellac in methylated spirit. The excess spray may be removed by an exhaust hood. The spirit is removed by passing the material over a steam-heated surface, and the fabric is passed over a gas furnace to set the shellac and improve the finish. In treating cotton fabric, the loose fibers are first removed by singeing. Before treatment with Al acetate, the material is preferably treated with aluminous or gelatinous matter and HCHO in any known way, and, after this treatment, may be dyed by means of a direct diamine black or one developed from diamogene black with β-naphthol and phenylenediamine. Dyeing may be followed by a second treatment with gelatin and HCHO.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

Production of zinc oxide from low-grade carbonate ore at Leadville. ANON. *Met. Chem. Eng.* 13,.631–3(1915).—Gravity and flotation methods have proved unsuccessful because of the intimate admixture of SiO_2 and Fe oxides and a satisfactory igneous process has superceded it. The ores treated consist mainly of carbonates assaying from 16 to 18% Zn, with but 0.1% Pb. At the Leadville works the furnace is of the Wetherill type, 65 ft. long, divided into 8 double-ended arched fire boxes. A charge for a 7-hr. run for one compartment consists of 2000 lbs. ore and 1100 lbs. coal intimately mixed and fed from each side simultaneously. A blower supplies 4-oz. blast at the rate of 32,000 cu. ft. per min. The gases and fume leaving at 1000° are cooled in a long flue and reach the baghouse at 140°. The product is 95–96% ZnO, suitable for use as pigment without reburning. H. L. OLIN.

A new colorimetric method for the detection of manganese in paint, varnish, oils, etc. J. F. SACHER. *Farben-Ztg.* 20, 1309(1915); see *C. A.* 9, 2043. E. W. B.

Shipment of monomethylaniline in tank cars. ANON. *Farben-Ztg.* 20, 1313 (1915).—Discussion of German shipping regulations. E. W. BOUGHTON.

Zinc green. ANON. *Farben-Ztg.* 20, 1256–7(1915).—General article on prepn., properties and use of zinc green, a pigment composed of Zn chromate and Prussian blue. E. W. BOUGHTON.

Protective coatings. P. ROHLAND. *Farben-Ztg.* 20, 1280–1(1915).—A review giving list of materials for protective coatings, such as asphalt, alkalies, chromates,

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etc., and discussion of their action, *e. g.*, the liberation of OH ions, decreasing permeability, etc. E. W. BOUGHTON.

Rust protection by painting. P. M. GREMPE. *Elektrochem. Z.* **22**, 93–4(1915).—Sixteen well known kinds of paints were examd. for their rust-proofing qualities. The covering power, thickness of coating, time for drying, elasticity and adhesiveness were also investigated. It was found that the tar and asphalt base paints became brittle after a time and checked off. Some of the drying oil paints were better but tend to absorb water and are quite expensive. None of the paints examd. were entirely satisfactory. W. E. RUDER.

Action of nitric acid on rosin and its relation to autoöxidation of rosin. L. PAUL. Strassburg. *Seifensieder-Ztg.* **42**, 640–1, 659(1915).—P. describes expts. in which HNO_3 was allowed to act upon rosin at room temp. and m. p. detns. and soly. tests were made on some of the products. He concludes that α-pininic acid is formed when rosin is sapond. by alkalies and that α-pininic acid is transformed by autoöxidation into β-pininic acid; he makes other similar statements which are not borne out by the work presented. P. uses symbols of his own to designate products which he obtained at the various steps but which he did not analyze or investigate further than to make m. p. detn. Tap water of high lime content was used for some of the work. P. E.

A resene in rosin. L. PAUL. Strassburg. *Chem. Rev. Fett-Harz-Ind.* **22**, 30–33(1915); cf. *C. A.* **8**, 2626, 3379; **9**, 972.—P. believes he has isolated a resene and α- and β-pininic acids from com. rosin dust by a series of manipulations which leave grave doubt as to the correctness of his conclusion. He believes that the α- and β-pininic acids and resene are formed through the action of H_2O or alkali on com. rosin. P. ESCHER.

Use of the flaming arc in paint testing (MOTT) **25**.

U. S., 1,153,975, Sept. 21. O. V. THOMAS. **An electrical insulating mixture** is formed of equal amts. of ground mica (washed free of salt or alk. substances), resin and resin oil.

Brit., 12,766, Aug. 19, 1913. F. V. RAYMOND. In **treating kauri** and other resins with sand-blasts as described in 18,857, 1913 (*C. A.* **9**, 388), the resin may be subjected successively to blasts of different force or containing sand of varying degrees of coarseness. The sand-blasts may be obtained by the use of hydraulic power, and the air or other fluid may be heated. The resin may be successively heated and cooled to facilitate the cleaning, and may be treated with H_2O jets after treatment with sand-blasts.

Brit., 12,768, Aug. 19, 1913. F. V. RAYMOND. In **treating kauri** and other resins as described in 18,857, 1913, and 12,766, 1914 (*supra*), the sand-blasts are replaced by blasts of steam, H_2O, or air, or of steam containing sand; or the various blasts may be used in conjunction, and of varying force or containing sand of various degrees of coarseness. The treatment with sand-blasts, steam-blasts, and air-blasts may be carried out in sep. cabinets built over an endless conveyer carrying the resin.

Brit., 12,769, Aug. 19, 1913. F. V. RAYMOND. In **cleaning kauri** and other resins by sand-blasts, the pieces of resin are carried in meshed trays on an endless conveyer through a cabinet containing nozzles which direct sand-blasts on to the resin above and below and at different angles. The lower part of the conveyer passes through a tunnel formed in the cabinet.

Brit., 12,770, Aug. 19, 1913. F. V. RAYMOND. In **cleaning kauri** and other resins by blasts of sand, the used sand gravitates to a sand pit, from which it is raised by a fan through pipes, one of which has a widened end which allows heavier dust

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and sand to fall by gravity into a recess from which it is returned to the hoppers while the light dust passes into the settling room. A fan co-axial with the fan mentioned above withdraws dust from the casing through pipes and discharges it through a pipe with a widened end into the settling room. Sand falls into a recess and is returned to the hoppers.

Brit., 13,100, May 28, 1914. J. H. HARDCASTLE and A. H. TAYLOR. **A varnish** which may be used for treating fabrics, or for general purposes, is composed of cellulose acetate, acetone, alc., benzene, trichloroethylene, and $CHCl_3$, with or without an addition of resorcinol diacetate for giving greater flexibility.

Can., 164,652, Aug. 31, 1915. R. B. LLOPART. **The step in the purification of inalterable white pigment.** See U. S., 1,140,354 (*C. A.* 9, 1849).

Can., 164,651, Aug. 31, 1915. R. B. LLOPART. **Production of zinc sulfate.** See U. S., 1,142,795 (*C. A.* 9, 2295).

27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

Chemistry in the service of the stearin and candle industry. G. SELFERT. *Seifensieder-Ztg.* 42, 454–6, 473–7, 495–8, 512–4, 530–5, 554–6, 574–7, 595–7, 618–21, 638–40, 679–82(1915).—A good description of the raw materials and the intermediate and finished products of candle making from the standpoint of chem. control, treating of the following subjects: *A.* Stearin mfg. (*a*) Raw materials. 1. Bone grease with detailed methods of examn. and results of 37 samples. 2. Various greases with analytical table of 14 U. S. greases. 3. Palm oil from *Elaeis guineënsis* with analysis of 16 oils from different localities. 4. Tallows, with table of 24 samples of various origin. 5. Chinese tallow, shea butter and Illipe tallow. 6. Fish oils and fish stearin. 7. Hardened fats and oils. (*b*) Intermediate products. 1. Preliminary purification of neutral fats and autoclaving. 2. Glycerol water. 3. Washing of fatty acids and acidification (transforming oleic into sulfo-acid, by steam into hydroxy-acid and by distn. into isoleic acid). 4. Distd. fatty acids, mixing and washing, with analyses of 32 samples. 5. Cold pressing. 6. Warm pressing with table of titer, I no. and physical structure of mixt. of "Olein" and "Stearin" varying from 0–100% at intervals of 1%. 7. Goudron. (*c*) Finished products. 1. Olein with methods of analysis and table of 24 samples. 2. Stearin with short scheme of calcd. results. *B.* Candle making. 1. Stearin. 2. Paraffin. 3. Ceresin. 4. "Montanwachs" (extracted waxes from brown coal). 5. Spermaceti. 6. Beeswax, with analytical methods and table of 24 samples from various sources. 7. Candle valuation. P. ESCHER.

Catalytic reduction of unsaturated fats and fatty acids. E. ERDMANN. Univ. angew. Chem., Halle. *J. prakt. Chem.* 91, 469–506(1915); cf. *C. A.* 7, 2696, 3244; 8, 833.—Contrary to the statements of Meigen and Bartels (cf. *C. A.* 8, 2271), who ascribe to Norman [cf. Ger. Pat., 141029(1902)] the priority in successfully reducing fats in the liquid state. E. claims that Bedford, Erdmann and Williams (cf. Ger. Pat., 266,438(1911)) who first established the fact that NiO is an especially good catalyzer for the reduction of unsatd. fats and fatty acids under atm. pressure, deserve this distinction; furthermore, the statement of M. and B. that NiO is only active as a catalyzer when it has been previously more or less reduced to the metallic state, is incorrect. Comparative expts., using voluminous NiO and Ni under exactly the same conditions for reducing linseed oil show that NiO is much more active than the metal; whereas the hardening with the former catalyzer began almost at once, with the latter the oil remained clear and liquid even after 7

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hrs. treatment. In fact, if the proper conditions are observed, the formation of metallic Ni during the reduction of an unsatd. fat in the presence of NiO, can be entirely avoided, as shown by the analysis, $Ni(CO)_4$ test, electrical cond. and sp. gr. of the used catalyzer. Consequently Ni cannot be considered the H carrier in this case. The conditions necessary for obtaining a Ni-free, used catalyzer are: (1) an oil, free from reducing impurities (a precaution not observed by M. and B. and probably their chief source of error, for commercial cottonseed oil contains reducing substances, removable by distn. with steam, which will reduce NH_3-$AgNO_3$ to Ag at 100°, and would thus naturally produce metallic Ni in a used NiO catalyzer); (2) the reduction must be interrupted as soon as the hardening is complete, for after the oil is completely reduced, the H will attack the catalyzer if the temp. is above 200°. Not only is metallic Ni not the H carrier, but its formation must be carefully avoided, for a flaky, Ni-carrying catalyzer is no longer useful as a carrier. A large excess of catalyzer and a high temp. with an easily reducible oil like cottonseed oil, favor Ni formation. An investigation of the delicacy of the $Ni(CO)_4$ reaction as a test for metallic nickel showed it to be of value only when carried on at 30–35°, at which temp., if no mirror appears within 15 min., the absence of Ni is assured. On the other hand, if the test is performed at 60–85°, after some time a mirror will appear though no metallic Ni was originally present. At the higher temps. CO thus acts as a reducing agent, as E. shows by establishing the presence of CO_2 in the products. As M. and B. carried out their $Ni(CO)_4$ tests at 90°, their results have no weight in showing the presence of Ni in used catalyzers. According to E., the assumption of the formation of a "nickel oxide hydride" offers the most satisfactory explanation of the catalytic action of NiO. When NiO, which has been used for hardening linseed oil at 205–60°, is recovered and the fat removed by C_6H_6, it has an elec. cond. of 0. When, however, this is dried in CO_2 to const. wt. and then heated to 270°, 4.43% H_2O is evolved, leaving an electrically conductive residue. The examn. of 4 different samples of used NiO catalyzers in the previous manner, gave from 3.8 to 4.4% H_2O in each case, though the cond. of residue did not always show the presence of Ni. These results prove that the used catalyzers contain H and this H is doubtless of significance in the activity of the NiO. Nickel oxide hydrides of the following types would conform to these facts: $HNiOH \longrightarrow H_2O + Ni$; $HNiONiOH \longrightarrow H_2O + Ni_2O$; $HNiONiH \longrightarrow H_2O + 2Ni$. Furthermore, a study of the elec. cond. showed that in certain cases the used catalyzers had a greater resistance then NiO itself, which gives support to the view that a lower oxide of Ni is represented, for it accords with the fact that lower oxides are distinctly poorer conductors than the corresponding higher oxide. This paper contains a very extensive bibliography of the previous work on the catalytic reduction of unsatd. glycerides.

NORMAN A. SHEPARD.

Purification of wool fat. J. MARCUSSON. *Seifenfabr.* **35**, 693–4, 714–6(1915).—The purification of wool fat for cosmetic purposes, removal of odor, color and free acids, and its purification for soap, and other technical purposes, by distn. with superheated steam at 300–350°, is briefly described. The chem. properties and analytical behavior of the various products, such as wool fat, oleins, soft wool fat distillate and wool fat stearin are described in much detail. A new patent application (German) by S. Morgenstern is said to prevent the usual decompn. during distn. of both the alcs. and the acids.

P. ESCHER.

Opportune changes in the manufacture of grained soap. EDITORIAL. *Seifenfabr.* **35**, 733–4(1915).—A plea to substitute KOH in place of soda ash in converting the present annual amt. of 100,000 tons of fatty acids into grained soda soap for the following reasons: in the manuf. of soda ash a certain amt. of NH_3 is permanently lost, a smaller production of ash would make this N loss smaller; the lathering quality of the soap

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would be improved by the retention of some K soap in the finished product; the present govt. decree against exportation of K salts has cut down their production and the use of KOH would stimulate especially those factories that produce $KClO_3$ and KOH. The increased cost of KOH against Na_2CO_3 is offset by an easier control of the sapon., by a better quality of the product and by an increased yield where K soaps are the final product. P. ESCHER.

Detection of fish oils and their hydrogenation products. J. DAVIDSOHN. *Seifensieder-Ztg.* 42, 657–9, 678–9(1915).—An investigation and discussion of Marcusson and Huber's octabromide method and Tortelli and Jaffe's method for detecting fish oils. The former method is long and complicated and the latter unreliable and not sensitive. A table of 34 tests with various oils is given. E. SCHERUBEL.

Utilization of fish oils and by-products fat in the soap, stearin and fatty acid industry. C. H. KEUTGEN. *Seifensieder-Ztg.* 42, 552–3, 573–4, 594–5, 617–8(1915). —Sandberg has recommended that fish fatty acids be treated at 25 to 40° with 20 to 25% H_2SO_4 of d_{15} 1.85 in order to bind the amines and amides so that they can be removed by washing. This process attacks the fatty acids, causing low yields and excessive pitch production. Treatment with $K_2Cr_2O_7$ or $KMnO_4$ gives good results when properly carried out, but there is danger of forming emulsions. There are patents based upon heating the fatty acids at high temps. and passing through indifferent gases or using superheated steam, but the best method is hydrogenation. Another method recommended is to purify by means of acid washing with H_2SO_4 and then to subject to cleavage and distg. If the autoclave process is used the amt. of H_2SO_4 necessary for acidification of the product is 4 to 5% of 66° Bé. acid. The best temp. is from 90 to 115° and the time required is 1.25 to 1.5 hrs. By using fractional distn. fish-oil fatty acids can be obtained suitable for the candle industry. If all purification processes are properly carried out before and after distn., odorless fatty acids can be obtained. Soaps made in 1912 from such fatty acids have no odor at the present time. The oils are thoroughly purified by acid washing or $Al_2(SO_4)_3$ treatment and dried *in vacuo*, after which they are subjected to a stream of CO_2 at temps. from 125 to 250°. The product has the appearance of polymerized oil and should be washed with dil. acid. By condensing the substances with CO_2 a yellowish product is obtained of 22 to 38° titer. This finds use in the stearin industry. E. SCHERUBEL.

Hardening of oils without pressure by the application of nickel and its compounds as catalyzers. W. SIEGMUND AND W. SUIDA. Tech. Hochschule, Wien, *J. prakt. Chem.* 91, 442–68.—When linseed, cottonseed, rape or sesame oils are reduced in glass vessels similar to those used by Bedford and Erdmann (cf. *C. A.* 7, 3244) with electrolytic H under ordinary pressure at 230–60° in the presence of NiO (*a*), Ni (*b*), basic Ni carbonate (*c*), $Ni(HCO_2)_2.2H_2O$ (*d*), or a mixt. of (*b*) + (*c*), and the rate of reduction followed by means of the I no., the speed of the reaction is found to vary greatly. By plotting these results a very instructive set of curves is obtained. The reaction *at first* proceeds most rapidly with the mixt. of (*b*) + (*c*) as catalyst, but *later* is surpassed by (*d*). Though the initial speed with (*a*) is less than that with (*c*), (*d*) or (*b*) + (*c*), at the end of 3 to 4 hours it is greater than that of (*c*) and the same as that of (*d*) and (*b*) + (*c*). From the start, the speed with (*b*) alone is very much lower than with any of the other catalyzers. The behavior according to S. and S. gives further support to the assumption of Ipatiew (cf. *C. A.* 3, 1007) and Meigen and Bartels (cf. *C. A.* 8, 2271) that H_2O plays a part in the catalysis. The finding of S. and S. in regard to the speed when (*b*) is used is directly contradictory to the statements of M. and B., who state that the hydrogenation proceeds more rapidly when finely divided Ni is used instead of the oxide. As the latter investigators worked in Cu vessels and do not state the pressure used, this may account for the differing results. The catalyzers (*a*),

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(*c*), (*d*) and (*b*) + (*c*) show approximately the same composition after use. Analysis of NiO, after use, corresponded to an average of 91% of a suboxide, Ni_2O, about 7% Ni soap and 2% H_2O. Attempts to show the presence of small quantities of Ni in the used catalyzers by means of a study of their electrical conductivity and sp. gr. were not conclusive as to the *entire* absence of the metal, owing to the presence of the organic matter and H_2O, yet the results indicate that the used catalyzers contain no significant quantity of metallic Ni, and that the Ni content of 4.6% detd. by means of the $Ni(CO)_4$ reaction by Normann and Pungs (cf. *C. A.* **9**, 1552) is much too high. If Ni is the carrier, then a mixt. of Ni with a lower oxide should give an exceptionally active carrier; this proved to be the case at the start when (*b*) + (*e*) was used, but examn. of the used catalyst showed that the metal had entirely vanished, an oxidation having taken place. There is thus no method of increasing that minimum quantity of Ni in the used catalyzer so that its presence may be demonstrated, unless the reduction is continued after the fat has become completely reduced. This leads to the conclusion that the unsatd. condition of the oil prevents the further reduction of the oxides to the metallic state. When pure cottonseed oil is heated at 250° in a stream of CO_2 free H in the presence of (*c*) CO_2 is evolved in large amt., the decompn. into NiO, CO_2 and H_2O taking place just as when the oil and H are absent. (*d*) decomps. on heating at 250° in an atm. of N into CO_2, CO, H_2O and H, leaving a residue of approx. the comp. Ni_3O. S. and S. sum up as follows: "It is therefore established that Ni, if it is formed at all, exists only in minimum quantities and then takes *no* part in the hardening. Hardening with (*c*), (*d*) or (*b*) + (*c*) is identical with that accomplished by the application of (*a*); *a lower oxide of Ni is the hydrogen carrier.* This hardening is essentially different from one carried out with (*b*), and one can entirely agree with Ipatiew that the suboxide is the H carrier." NORMAN A. SHEPARD.

Coconut oil and palm oil. J. R. N. VAN KREGTEN. *Chem. Weekblad* **12**, 788–94 (1915).—The Polenske numbers of coconut oil and palm oil offer the best means of distinction between these two closely related substances. At the same time the hardening of these oils produces but little change of the Polenske no. As appears from the difference in the Polenske no., the difference of the mol. weights is considerable. The mol. weights were detd. according to Juckenack and Pasternack (titration of the insol. fatty acids and weighing the resulting salts). The alc. salt soln. obtained by titration of the volatile fatty acids with 0.1 *N* NaOH was carefully evapd. to dryness in a Pt dish on the water bath and dried at 105° to const. weight. For the correction, the wt. of the added phenolphthalein and that of the salts, resulting from the preceding neutralization of the employed alc., was deducted. A blank proved this corr. to be about 1.5 mg., which is not to be neglected. The NaOH soln. should be carbonate free and very pure. The mol. wt. of the volatile insol. fatty acids amounts to $(10{,}000p/P) - 22$, in which p is the wt. of the Na salts and P the Polenske no. The wts. p, detd. in coconut oil and palm oil from different sources, vary for coconut oil from 0.3030 to 0.3351 (11 samples) and for palm oil from 0.1900 to 0.2164 (7 samples). Mol. wts. vary in the same cases for coconut oil from 168 to 170.8, for palm oil from 180 to 183.1. Polenske nos. for coconut oil vary from 15.85 to 17.55 for palm oil from 9.4 to 10.6. It is very difficult to det. the proportion of coconut oil and palm oil in mixts. of both, since the relation of their chem. data is very close. For the detection of small amounts of palm oil in coconut oil, the I no. is most reliable, this being rarely higher than 10 in the pure coconut oil, that of palm oil being 15 g. For the detection of an excess of palm oil, the Polenske no. is most important, a small amt. of coconut oil lowering the Polenske no. considerably. It is not difficult to detect a quantity of 20% of coconut oil in palm oil, but detection of the presence of palm oil in coconut oil is only possible when it contains at least 40–50% of the former. The presence of other vegetable or animal oils, however, prevents entire distinction. J. T. FLOHIL.

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Oil from lime seeds. H. A. TEMPANY. *Agric. News; Chem. and Drug.* July 3, 1915; *J. Soc. Chem. Ind.* 34, 804(1915).—Dried seeds from citrus fruits contain N 1.11, P_2O_5 0.58, K_2O 0.35, H_2O 9.3%. They are of lower fertilizing value than the majority of seeds and are deficient in protein, but rich in carbohydrate for feeding. The seeds yield 34.4% dark yellow oil, similar to olive oil in consistency. The oil has bitter taste when extd. by solvents. It might be used as a lubricant or as soap stock.

J. GAUB.

Philippine oil-bearing seeds and their properties. II. H. C. BRILL AND F. AGCAOILI. *Philippine J. Sci.* 10, 105–19(1915).—*Chisochiton cumingianus*, named cato by natives, is of wide distribution and abundant. The dry kernels contain 44% fat having the following consts.: d_{15} 0.9203, butyro refractometer at 30° 61, I no. 80.8, R. M. no. 73.4, sapon. no. 192, acid no. cc. 0.1 *N* KOH 7.06. The oil is satisfactory for soap purposes and is being used by one firm in Manila. *Sterculia foetida* called columpang, contains 51.8% oil in the dry seeds. The chem. consts. of the oil are: C_{15} 0.9254, butyro refractometer at 40° 64, I no. 76, R. M. no. 2.1, sapon. no. 212, acid no. 0.30, free fatty acids 0.45%. The oil resembles olive oil in its physiological action and should be useful for culinary purposes. *Canarium pachyphyllum*, which yields pili nuts, is widely distributed and the genus contains many species. The kernels contain 72–4% oil, which is suitable for culinary purposes, but there are 2 features to prevent its becoming important, *viz.*, the high % and the hardness of the shell. The chem. consts. are: d_{30} 0.9067, butyro-refractometer at 30° 54, I no. 60, R. M. no. 2–3, sapon. no. 190, free fatty acids 7–9, acid value 2.7–3. An investigation of the drying properties of the oils from the nuts of calumpany, cato, lumbang bato, lumbang banucalag, kapok pili, palo maria de la playa, and palo maria del monte was made. It was demonstrated that lumbang bato and lumbang banucalag are drying oils of high quality and compare favorably with linseed and chinawood oils. The others have no appreciable drying properties.

E. SCHERUBEL.

Modification of ylang-ylang oil standards. H. D. GIBBS. *Philippine J. Sci.* 10, 99–103(1915).—An extension of the classification at present in use is proposed. This extension is warranted on account of the large number of superior grade oils produced. Gibbs has added as a confirmatory test the soly. in alc. which Schimmel & Co. have rejected. The test consists in detg. the lowest strength of aq. alc. which can be mixed with the oil without cloudiness in the proportion of 2 of oil to 1 of alc.

E. SCHERUBEL.

Coconut and filled half boiled soap. J. B. *Seifensieder-Ztg.* 42, 677–8(1915).—Ten formulas are given for coconut oil soap made with filler and having yields from 200 to 1500%. The glycerol is removed from the oil according to regular kettle practice and the soap filled in the crutch, adding and working in the K_2CO_3 soln. first, wherever used, and then the rest of the filler. For a soap with 300% yield, one-third of the coconut oil may be replaced with tallow, and for a 400% yield one-fourth of the oil may be replaced by tallow.

E. SCHERUBEL.

Neutral fats in the leather industry (FAHRION) 29. Sludge from town sewage as a source of fat (HOLDE) 14.

U. S., 1,153,625, Sept. 14. E. C. KAYSER. **Soap powder** is made by combining sprays of alkali soln. (NaOH or Na_2CO_3 or both) and liquid fatty acid, *e. g.*, "red oil," issuing from nozzles, and collecting the soap powder thus formed in a settling chamber.

U. S., 1,154,495, Sept. 21. C. ELLIS. **Hydrogenating unsaturated liquid or solid fatty compounds.** Oil is supplied by the pipe 9 to the reaction chamber 1 and

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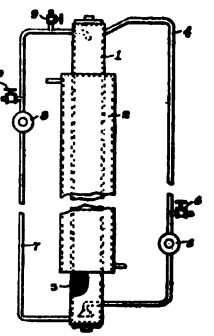
heated from the jacket *2*. The oil is circulated over filling material *3* in the reaction chamber by the pump *8* and gas (and Ni carbonyl) is circulated in the opposite direction by the pump *5*. The mixt. is sufficiently heated to decompose the Ni carbonyl which is the only catalyst used.



Brit., 12,308, May 19, 1914. O. STUART and D. C. ROBERTS. **Depericarping oil-bearing nuts** having a very hard pericarp by means of a chem. reagent which softens or dissolves the shell without attacking the kernel. Suitable reagents are HNO_3, to which H_2SO_4 may be added, NaOH, which may be produced in admixt. with Cl by the electrolysis of brine in a closed chamber containing the nuts, the phenols or their derivs., or a mixt. of $NaNO_3$ and H_2SO_4. The treatment may be carried out under increased or reduced pressure, and may be accelerated by heating.

Brit., 12,621, May 22, 1914. A. H. SUZMEYAN and P. A. A. SUZMEYAN. **Fats and glucose** are obtained from nuts, such as cohune, coquito, corozo, or cocoanuts, or from the shells or fibers, by grinding, extg. with benzine, or other spirit, and boiling the residue with H_2SO_4 or other acid.

Brit., 12,686, May 22, 1914. J. A. DECEW. **A resin soap or size,** in which the free resin is very fine and in larger proportion than usual, is obtained by adding any tannin ext., such as tannic acid, to the boil of resin with insufficient Na_2CO_3 or other alkali for complete saponification, and then dilg.

28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

Action of chloroform and ether on the inversion of sucrose in beet root. P. MAZÉ. *Compt. rend. soc. biol.* 77, 549–50(1914).—When portions of beet root containing 7.5% of sucrose were placed in aq. solns. of $CHCl_3$ or Et_2O it was observed that the amt. of total sugar which passed from the root was greater than in the case of H_2O alone, while the proportion of invert sugar was likewise increased. $CHCl_3$ and Et_2O are believed to intensify the action of invertase and also to cause a more abundant secretion of the same. H. S. PAINE.

Tests of seedling canes, 1912–15. Results obtained at St. Augustine Estate, Trinidad. JOSEPH DE VERTEUIL. *Bull. Dept. Agr., Trinidad and Tobago* 14, 110–5 (1915).—V. gives % juice, sp. gr., % sucrose, % glucose, % non-sugar, sucrose per gallon, yields per acre, etc., of various canes. W. H. FRY.

Heat losses in drying beet slices. F. R. JANAK. *Deut. Zuckerind.* 39, 641(1914). —J. considers a drier which has a capacity of 50,000 kg. of dried beet slices per 24 hrs.; it is assumed that 100 kg. of exhausted beet slices (the dry substance of which has been increased from the original 7% to 14% by pressing) yield 15 kg. of dried slices with a H_2O content of 10% after drying is effected. On the above 24 hrs. basis 176 million cals. of heat will be required for drying the beet slices. In addition there is a loss of 86,340,000 cals. which is distributed as follows: (1) 24,840,000 cals. which are eliminated with the evapd. H_2O, the temp. of the latter being taken as 90° for purposes of calcn.; (2) 54 million cals. which are lost in the chimney with the flue gases; (3) 4.5 million cals. which represent the difference between the temp. of the dried beet slices and that of the air, and which are dissipated when the slices are removed from the drier; (4) 3 million cals. which are lost with the slag from the furnace and the unburned coal enclosed in this slag. It is calcd. that the heat lost in the flue gases and in the H_2O

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evapd. from the beet slices would be sufficient to produce 21,800 kg. of dried beet slices under the conditions assumed above. The use of this lost heat in this manner (or for the fore-warming of juices) is not mechanically impossible and certain suggestions along this line are made. The other heat losses are not entirely avoidable, but are capable of considerable reduction. H. S. PAINE.

The valuation of wheat and its ground products as raw material for the starch industry. GOLDBECK. *Chem. Ztg.* 39, 689(1915).—The method gives reliable practical results if carefully followed. Rub 200 g. flour to a smooth dough with 120 g. (60%) H_2O, requiring about 10 min., and let stand 25 min., counting from the time the H_2O was added. Then wash with the bare hand in about 2.5 l. H_2O until nearly all of the starch is in the H_2O, wash the remaining gluten twice in pure H_2O and press lightly. Unite the washes and pour through a silk sieve, 20 meshes to the cm., weigh the retained particles of gluten, add to the main portion, let stand 1 hr. in porcelain dish, pour off the sepd. H_2O, weigh, spread on a weighed piece of paper and dry for 2–3 hrs. at 40–5° and weigh. The more wet gluten is retained on the sieve the poorer will be the yield, a flour giving more than 2.5% being mostly dissolved in the washing machine. The wash-H_2O is poured through a 20-mesh silk sieve and the residue dried and weighed. The filtered H_2O is let stand 6 hrs., the H_2O poured off, the starch stirred up and concd. to 14–16° Bé. and centrifuged for 12 min. at 750–800 r. p. m. The white starch is then easily sepd. from the overlying fine starch, and both are dried and weighed. J. H. MOORE.

Catalytic elements and rare fertilizers in sugar beet culture (MUNERATI) 15.

U. S., 1,154,557, Sept. 21. J. J. ARMSTRONG. **Preparing raw sugar for shipment.** The sugar is compressed into large blocks to reduce its vol. and form a hard protective skin on the surface of the blocks.

29. LEATHER AND GLUE.

LLOYD BALDERSTON.

Gambier. ANON. *Hide and Leather* 49, 22, 33(1915); *J. Am. Leather Chem. Assoc.* 10, 439(1915).—The director of the Government lab. at Buitenzorg (Java) has contributed an article to the Holland Dept. of Agr. Industry and Commerce on the tanning material known as gambier. The leaves contain the tannin, which is extd. in concd. form by boiling (equal wt. water and leaves) in an iron pan over an open fire. Chinese gambier boilers pour boiling water over the leaves several times and use the weakest residue liquor for the next batch. The ext. is sometimes poured into molds, sun-dried and marketed. It is sticky but contains a high % of tannin. Cube gambier contains 55–63% tannin. Block gambier usually has about 40% tannin; 50% has been reported from the thoroughly modern and scientific plant located at Asahan, Sumatra, Dutch Indies. Gambier, if skillfully used, gives leather that is cream-colored, soft and supple. If used too strong the leather is brittle. Combined with chrome or alum, gambier gives a beautiful color. Gambier is obtainable all of the year. J. S. ROGERS.

Decree against neutral fats in the leather industry. W. FAHRION. *Chem. Rev. Fett- Harz-Ind.* 22, 77–80(1915).—The demand for glycerol for war purposes has caused the German govt. to forbid the use of neutral fats in the soap and textile industries and it is contemplated to extend this to the leather industry. F. argues against such a step and points out that solid fatty acids sep. from liquid fatty acids more easily in the free state than when combined as mixed glycerides. He believes that the use of fatty

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acids in place of neutral fats would greatly increase the present amt. of inferior "uppers," etc., in manfd. shoes: (1) by blooming, caused by a thin film of solid fatty acids which had sepd. in the leather from the neutral fats and deposited on the surface, and (2) by "rosin sweating," caused by the oxidation in the finished leather of unsatd. glycerides (fish oils) and still more of unsatd. free acids, whereby the vol. and temp. of the acids is increased, forcing the more liquid resinified acids to the surface. Both of these faults occur mostly in black leathers. P. ESCHER.

Enzymes. J. T. WOOD. *Leather Trades' Year Book* 1915, 197–200; *J. Am. Leather Chem. Assoc.* 10, 472–5(1915).—Discussion of the action of enzymes in general, with some particulars in regard to those which effect the "bating" of skins. Reference is made to the discovery of O. Röhm that it is possible to prep. a mixt. of enzymes which will unhair and bate skins in one operation. L. B.

Absorbent power of plumped hide toward vegetable tan-stuffs. E. KUDLACEK. *Collegium* 1915, 1–25, 59–80, 117–29.—Myrobalans, mangrove bark, fir bark and oak bark were tested, pieces of delimed and washed calfskin being tanned in several liquors of increasing strength. The liquors were treated with chloroform and thymol to prevent loss of tannin by fermentation. Analysis of the liquors before and after use gives the amount of tans and non-tans absorbed by the skin. Oak and myrobalans are absorbed more rapidly than fir and mangrove. At first the absorption of non-tans is slight, but soon becomes relatively large. The character of the resulting leathers was studied in detail. The oak leather was most elastic, the fir had highest breaking resistance, and mangrove lowest. Fir and oak leathers had more heat-resistance than the other two. L. B.

Detection and separation of artificial tannins from each other and in the presence of vegetable tannins. L. LAUFFMANN. *Kunststoffe* 5, 205–7(1915).—A review of methods given in the literature. F. W. SMITHER.

Adulteration of leather. H. R. PROCTER. *Leather Trades' Year Book* 1915, 109–11; *J. Am. Leather Chem. Assoc.* 10, 486–8(1915).—The remedy lies with the buyer, who may demand a guarantee of water-soluble not to exceed a % agreed upon, and who should abate his demand for light colored leather because all bleaching processes are harmful. An approximate method of detg. water-soluble is described. L. B.

Syntans and their production. E. E. WILKINSON. *Leather Trades' Year Book* 1915, 147–50; *J. Am. Leather Chem. Assoc.* 10, 466–9(1915).—The substances required are crude cresylic acid, H_2SO_4, HCHO and NaOH. Three processes are involved sulfonation, condensation and neutralization. Equal weights of cresylic acid and H_2SO_4 are heated together. The time of sulfonation varies from 1.5 to 3 hrs., completeness of the process being judged from the appearance of the material. The sulfonated material is cooled and HCHO soln. run in slowly with constant stirring, the temp. being kept below 35°. At the conclusion of the condensation process, the substance should be a dark brown, very viscous liquid, whose acidity is about 25%, as H_2SO_4. NaOH is added slowly, with external cooling, to keep the temp. below 35°, until the acidity is reduced to 4.9% as H_2SO_4. L. B.

Drum tanning. E. NIHOUL. *Leather Trades' Year Book* 1915, 180–5; *J. Am. Leather Chem. Assoc.* 10, 460–5(1915).—Several advantages are claimed: the time is shorter than in the older methods, and there is less loss of tannin by fermentation. The quality of the resulting leather is said to be better, especially in the case of light leathers. L. B.

Dyeing and staining of leathers in war time. M. C. LAMB. *Leather Trades' Year Book* 1915, 201–5.—Possible substitutions of vegetable colors for aniline dyes. L. B.

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Some notes on liming. W. JAMES AND P. R. BARKER. *Collegium* (London edition) 1915, 136–7; *J. Am. Leather Chem. Assoc.* 10, 507–9(1915).—Long and short periods of liming are compared; the former gives the better results. L. B.

Some notes on liming. H. G. BENNETT. *Collegium* (London edition) 1915, 213–5; *J. Am. Leather Chem. Assoc.* 10, 509–12(1915).—Answer to James and Barker (cf. preceding abstr.). L. B.

Brit., 12,952, May 26, 1914. R. VIDAL. **Cleaning, preserving, and depilating hides and skins** by treating them with an aq. soln. containing 5–10% of a crystd. alk. sulfite or hyposulfite associated with an alkali, NH_3, or an alk. carbonate or sulfide. An after-treatment with acid may be employed before stripping the hair, the effect being to make the skin tougher. As an example, sheepskins are soaked for 12–15 hrs. in a soln. containing 5–10% of an "association" of 66% of hyposulfite or crystd. sulfite with 33% of anhydrous carbonate. Before the hair is stripped, the skin may be subjected to a bath containing 5–10 cc. of H_2SO_4 to the liter. An alternative assn. consists of 90% of hyposulfite or sulfite and 10% of alk. sulfide, alkali, or 20° Bé. ammonia. The assns. can be made by fusing together the cryst. ingredients or by employing concd. solns. in the case of alkalies. The above process also cleans, bleaches, and removes the grease from the hair and wool.

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30. RUBBER AND ALLIED SUBSTANCES.

R. T. STOKES.

The testing of rubber goods. Bur. of Standards, *Circ.* 38, 3rd edition(1915). —General information under the following captions: (1) Introduction; sources and nature of rubbers, etc. (2) Mechanical rubber goods; methods of manuf. and properties of such materials as hose, belting, insulated wire, etc. (3) Physical testing of rubber; methods for detg. tensile strength, elongation, for measuring thickness, etc. A description of machines is given and the influence of different factors on the results is discussed. (4) The chemistry of rubber; explanation of analysis. Bur. of Standards methods and methods of the Joint Rubber Insulation Committee. (5) Bibliography. (6) Regulations regarding tests. E. W. BOUGHTON.

Brit., 13,128, May 28, 1914. E. B. COOK. In mfg. **rubber and leather compositions,** leather reduced to its fibrous state is mixed with a vulcanizable rubber compd. in a rubber-grinding or like mill with heated rollers, and the product is vulcanized by heat. In an example, 2.5 parts of leather fiber are added to a mixt. of 1.75 parts of crude rubber, 2 parts of reclaimed rubber, $1^7/_8$ parts of a filler such as diatomaceous earth or tripolite, 1.5 parts of PbO, 0.25 part of S, and a little lamp-black or other coloring matter. The rollers are heated to a temp. somewhat less than 212° F., and the vulcanizing is effected at about 135° F. The compn. may be used for shoe soles, pneumatic tires, door mats, and various tread surfaces.

Brit., 12,271, May 18, 1914. F. V. O'NEILL. **Reclaiming rubber waste** by treatment in a closed receptacle at a temp., preferably about 130°, at which the rubber is not injured, with rosin spirit, preferably refined, and then removing the solvent from the dissolved and devulcanized rubber by evapn. The refined rosin spirit consists of those fractions which distil off below 130°. The textile material which is filtered off may be washed with a solvent of raw rubber, and forms a by-product. The rosin spirit may be dild. with known solvents of raw rubber.

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CHEMICAL ABSTRACTS

Vol. 9. DECEMBER 10, 1915. No. 23

1. APPARATUS.

L. C. JONES.

Weighing buret. G. INCZE. Budapest. *Z. anal. Chem.* **54**, 406–8(1915).—A weight buret without a stopcock, the design being similar to that of a Gay-Lussac buret.
GEORGE W. MOREY.

A new gas generator. A. KLEINE. *Z. angew. Chem.* **28**, I, 388(1915); see *C. A.* **9**, 537.
E. H.

Detection and determination of combustible gases in mineral waters. ENRIQUE HAUSER. *Anales soc. españ. fis. quim.* **12**, 155–63(1914); cf. *C. A.* **8**, 2205.—H. describes an improved and simplified grisometer which consists essentially of a spherical, glass combustion chamber (in which is sealed a Pt wire with elec. connections), to which are attached upper and lower graduated tubes. Two close-fitting metal stopcocks connect these 2 tubes with the combustion chamber, these tubes being attached to the stopcock fitting by means of metal casings. H. also describes a modification of this grisometer, by means of which it can readily be attached to a CO_2 absorption bulb. Variations in temp. of the gas are corrected by varying the depth to which the grisometer is submerged in H_2O. This correction is based on the equivalence of a variation of 1° in temp. to a variation of 2.6 mm. Hg in pressure at Madrid; to this variation is added the difference in vapor tension of H_2O corresponding to each temp. H. has contrived an abacus, by means of which the depth to which the grisometer must be submerged may be quickly detd.
H. S. PAINE.

The determination of critical points in iron, steel, and alloys. ANON. *Met. Chem. Eng.* **13**, 643–4(1915).—A description of app. made by the Scientific Materials Co., Pittsburgh. The sample and a neutral body are heated simultaneously, thermocouples being introduced into drilled holes in specially designed tubes (illustrated) and sealed with alundum cement to prevent oxidation of the metals. One couple indicates the temp. of the sample and another has one junction in the sample, and the other in the neutral body to indicate differences in temp. Readings are taken either on a special double galvanometer, one scale showing temps. and the other differences between the sample and neutral body, or on a special, 3-pen chronograph.
W. L. BADGER.

A thermostat for moderate and high temperatures. J. L. HAUGHTON AND D. HANSON. Natl. Phys. Lab. *J. Inst. Metals* **1915** (advance copy), 7 pp.—For equil. diagram work on alloys a thermostat was built consisting of two glass bulbs each connected to one leg of a Hg U-tube through a 3-way cock which allows altering the height of Hg or the air pressure in the bulb. In one leg is a permanent Pt contact and in the other is another Pt wire giving with the Hg a make and break contact. One bulb has a re-entrant tube within it, in which the specimen is placed, the tube being plugged with asbestos. Resistance wire is wound about the outside of the bulb. Part of the current through this is cut in or out by the Hg switch, thus holding the temp. steady. The other bulb is kept on ice in a Dewar flask, thus avoiding errors due to changes in room temp. As the bulbs are closed, changes in barometric pressure have no effect. When using a new furnace bulb the temp. slowly rizes for sometime due to aging of the glass.

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With glass the temp. limit is 500°, but with a SiO_2 furnace bulb this could be raised to 1000°. H. W. GILLETT.

Cement for polarimeter tubes. T. S. PATTERSON. Univ. Glasgow. *Nature* **95**, 590(1915).—Suggestions are given for a cement suitable for fastening the end disks of polarimeter tubes in such a way as to resist the action of organic liquids at high temps. W. H. ROSS.

A new multiple-type recording instrument for pyrometers. ANON. *Met. Chem. Eng.* **13**, 643(1915).—The app. combines an indicating and a recording instrument. Up to 6 records are made by pressing the needle upon a typewriter ribbon against a roller bearing different symbols for the different records. The commutator has Hg contacts. Five hrs. of the record are always visible. The readings are taken every 20 secs. Supplied by Chas. Englehard, N. Y. W. L. BADGER.

Pulverizers. OSKAR NAGEL. *Chem. App.* **2**, 197–9, 221–3(1915).—A review of grinders, ball-mills, etc., with 11 cuts. J. H. MOORE.

Device for emptying centrifugals. H. EBERHARDT. *Deut. Zuckerind.* **40**, 10 (1915); *Wochschr. Zentralver. Rübenzuckerind.* **53**, 69(1915).—An arm comes up through the bottom of the basket and scrapes out the load if the machine is started a few revolutions. One man can handle 23 loads per hr. W. L. BADGER.

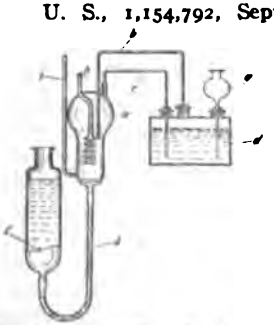
New vacuum pump. ANON. *Met. Chem. Eng.* **13**, 769–70(1915).—An Ingersoll-Rand pump of the type of the "Imperial" compressors, designed for vacuum filtration. Intake valves (Corliss type) and discharge valves (poppet) are so placed as to make the clearance a minimum and to allow of complete H_2O-jacketing. There is no equalizing device. Vacuum within $^1/_2$" of the barometer is guaranteed. W. L. BADGER.

New portable magnetic separator. ANON. *Met. Chem. Eng.* **13**, 770(1915). —An outfit made by the Cutler-Hammer Clutch Co., Milwaukee, for use where only a. c. is available. Motor, d. c. generator, separator, and panel are mounted on a frame and form a single portable unit. W. L. BADGER.

Acid-resisting alloy for bomb calorimeters (PARR) 9.

U. S., 1,154,663, Sept. 28. W. F. SHORE. **Scleroscope** depending upon height of rebound of a falling striker, from the object being tested, to determine its approx. hardness. The height of rebound is indicated by a pointer on a graduated dial, which remains in position until reset by hand.

U. S., 1,154,792, Sept. 28. O. MATZERATH. **Gas-analyzing apparatus.** The gas to be tested is introduced into the measuring vessel *a* through the pipe *i* and by pressure of liquid from the vessel *f* is forced in measured vol. through the pipes *b* and *c*, partly through and partly over the absorbing liquid *d*. The residual, unabsorbed gas is sucked back into the measuring vessel by lowering the liquid receptacle *f* and its loss of vol. detd. *h* is a vent open to the air.



U. S., 1,155,422, Oct. 5. J. KARL. **Acetylene generator.**

U. S., 1,156,176, Oct. 12. M. O. REICHE. **An apparatus for determining the percentage of "lime" or carbonates in soil and other materials.** The cup 11 is filled with a weighed sample of dried earth or other material and the lower portion of the receptacle with dil. HCl. H_2O or dil. acid is poured into the funnel 15, after the stoppers 8 and 13 are inserted

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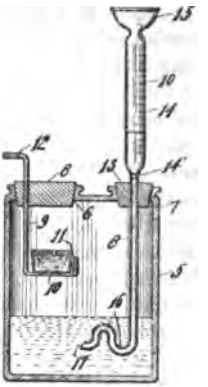

tightly, until the level of liquid in the tube 14 reaches the first graduation. The cup is then upset and the rise of liquid due to liberation of gas from $CaCO_3$ is noted.

U. S., 1,156,495, Oct. 12. E. M. RODEBAUGH. **Acetylene generator.**

U. S., 1,156,788, Oct. 12. M. E. LOEHR. **Acetylene generator.**

U. S., 1,157,385–6, Oct. 19. W. W. HARRIS. **Acetylene generators.**

U. S., 1,158,066, Oct. 26. R. MACLAURIN. **Gas-scrubber.**

Brit., 11,213, May 6, 1914. H. W. HARDINGE. App. for **separating coarse from finely divided material,** such as ores.

Brit., 13,599, June 4, 1914. SOCIÉTÉ E. BARBET ET FILS ET CIE. The plates of a **rectifying column** are made of low heat-transmitting capacity in order to prevent condensation of vapor on their under surfaces, and a circulation of cooling fluid, *e. g.*, by means of pipes immersed in the liquid on the plates, is provided in order to cause condensation of the vapor while bubbling through the liquid. The bubbling hoods may also be made of materials that are feeble transmitters of heat.

Brit., 14,976, June 23, 1914. J. J. BERRIGAN. A pressing app., described in connection with a bag **filter,** consists of one or more pairs of pressing members pivoted together and adapted to move downwards under the action of gravity or other vertical force, meanwhile moving also towards each other with a gradually decreasing angular swing about their pivot.

Ger., 283,500, Apr. 25, 1913. J. BARTH. A **testing tube for a pipe line,** provided with means for sealing with Pb.

Ger., 283,666, Dec. 25, 1913. MESSER & Co. Constructional details of a double valve for the O and gas control in **blast lamps.**

Ger., 283,827, Sept. 16, 1914. GES. FÜR ROHREN-REINIGUNG. Addition to 274,605 (*C. A.* 8, 3255). Details of a **tube-cleaning device.**

Ger., 284,116, July 22, 1913. C. MEISSNER. **Filtering apparatus** for sepg. solids from liquids.

Ger., 284,312, Feb. 20, 1914. J. VON KRUSZEWSKI. App. for **filtering colloidal substances** with the aid of 2 or more fine mesh sieves or finely perforated sheets, arranged in sequence.

Ger., 284,481, May 15, 1914. FILTER- UND BRAUTECHNISCHE MASCHINENFABRIK A.-G. v. L. A. ENZINGER. App. for **removing press cakes from filter presses.**

Ger., 284,482, Nov. 11, 1913. E. J. SWEETLAND. **Filter press** with casing made in 2 separable parts.

Ger., 284,578, Oct. 18, 1913. DÜRKOPPWERKE, AKT.-GES. **Centrifuge** for sepg. heavy from light liquids, wherein the specifically lighter liquid collects in the outer largest portion of the interior of the drum.

2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS.

Assistants: E. B. MILLARD and A. B. CARTER.

Periodic system and periodicity in properties. A. VOSMAER. *Chem. Weekblad* 12, 263–8(1915).—A general paper. GEORGE W. MORRY.

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Heat of fusion and the periodic system. JULIO GUZMÁN CARRANCIO. Madrid. *Anales soc. espaü. fis. quim.* 12, 526–34(1914).—C. shows that the heat of fusion per g. may be added to the other properties of the elements which vary as a periodic function of the at. wt. of the latter. Some of the values of the heats of fusion which were used for comparison were derived exptly., while others were deduced from the Guldberg relation ($w = R/40{,}000\alpha$, in which w = heat of fusion per g., R is a general const. and α is the coeff. of dilatation). The heat of fusion per g. was observed to decrease as the at. wt. increased in the case of elements of the same column (classification by the periodic system); the same relation is exhibited by corresponding compds. of the elements. From Crompton's relation $M_w/T_f = 2.96$ (where M = at. wt., w = the heat, of fusion per g., and T_f = the abs. temp. of fusion) it is deduced that $T_f/M = w/\text{const.}$ so that the variations experienced by the quotient T_f/M correspond to variations in w; this conclusion is confirmed by the data, *i. e.*, excepting the elements He, Ne, P, O, F, and Ce, the value of the relation T_f/M decreases as the at. wt. increases in the case of elements in the same column of the periodic classification. The values calcd. for the Crompton const. show greater concordance if they are grouped according to the periodic system. The values of this const. are subject to considerable error inasmuch as the const. is a function of both the at. heat of fusion and the temp. of fusion, neither of which is usually known with much accuracy. This fact favors the greater concordance of the values of the const. for elements of the same periodic group as compared with elements of different groups. From the preceding relations it is possible to predict the heat of fusion per g. in the case of elements for which this value has not been exptly. detd. The at. heat of fusion was observed in some cases to follow the variations of the periodic system, but there were many exceptions to the rule. H. S. PAINE.

Viscosity and fluidity. A. VAN ROSSEM. *Chem. Weekblad* 11, 799–813(1914). —An address delivered before the Delft Natuurwetenschapelijk Gezelchap.
GEORGE W. MOREY.

Coefficient of temperature of fluidity and its relation to heat of fusion. J. GUZMÁN CARRANCIO. Madrid. *Anales soc. espaü. fis. quim.* 12, 432–47(1914).—C. discusses heat of fusion from a theoretical standpoint and summarizes results which have been previously published. H. S. PAINE.

Annual report of the international committee on atomic weights. F. W. CLARKE, T. E. THORPE AND W. OSTWALD. *J. Am. Chem. Soc.* 37, 2449–52(1915).—Report of new detns. in 1915, and the international table for 1916. E. B. MILLARD.

Work of the Physikalisch-Technische Reichsanstalt in 1913. ANON. *Z. Elektrochem.* 21, 286–95(1915).—The work of Henning on the temp. scale between 0° and —193° with Pt and const. vol. H thermometers is briefly reported (cf. *C. A.* 7, 1835, 2892; 8, 1230). This work is being continued as well as measurements with the He thermometer at temp. of liquid H. **The resistance of some grades of Pt, Cu, and Pb wires** were measured (by HENNING) at the temp. of boiling H (—252.8°) and some higher temps. and results reported in a table. The resistance ratios $R = r/r_0$ and $R' = r'/r'_0$ between 2 Pt thermometers may be reduced to one another by the empirical formula $R' = R + A(R - 1) + B(R - 1)^2$; A and B are constants detd. from 2 related pairs of values of R and R'. The ratio R' of the unknown thermometer is observed at 2 fixed points (b. p. of O and b. p. of CO_2 or H_2O), the value of R for the same temp. being taken from the table. For the entire interval of + 100° to —253° the quadratic reduction formula does not suffice; between 0° and —253° it gave close values for all the varieties of Pt, except the English. **Specific heats of gases at low temps.** (SCHEEL AND HEUSE. Cf. *C. A.* 7, 2507.—The investigation was carried out along lines previously reported and extended to CH_4, C_2H_2, C_2H_4, C_3H_6. Work on A is in progress. **Specific heats of gases at high pressures.** Cf. HOLBORN AND JAKOB.

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C. A. 8, 2296.—Results on the av. sp. heat of air between 20° and 100° up to 200 atms. will be published shortly. The method of measurement has been improved. The sp. heat at 1 atm. agrees with the results of Scheel and Heuse but is greater than the Regnault value. **Equation of state of air and A.** HOLBORN AND SCHULTZE.—Isothermals of dry CO_2-free air and A at 0°, 50°, 100°, 150°, and 200°, for pressures between 19 and 76 m. of Hg were established. The abs. amts. of the %-value are correct to 0.3 per mil. Similar work is in progress with He. **Hg resistance thermometer.** JAEGER AND V. STEINWEHR. See *C. A.* 8, 2279; 9, 749. **Heat of reaction.** V. STEINWEHR. Cf. *C. A.* 8, 3146.—Measurements are being made with the differential calorimeter previously described for the calcn. of the heat of soln. of $3CdSO_4.8H_2O$. **Light-refracting power of liquid H** (MEISSNER) was detd. according to Wiedemann's method, results agreeing within 1 to 3 parts per mil. with published values. **Absolute expansion of quartz glass.** SCHEEL AND HEUSE. See *C. A.* 8, 1223. **The d. of He** was detd. by Heuse to an accuracy of 1 per mil. and the at. wt. 4.001 calcd. (Cf. *C. A.* 7, 2507.) **Heat conductivity of insulating materials.** JAKOB.—Cork (with binder), pressed horsehair, pressed cork (with little binder) and cork (with little binder) were studied in the form of plates at about 36°; results in above sequence showed: wt. per unit vol. of plates, kg./cu. m., 166, 143, 174, 317; heat cond. no., kg-Cal./*st.* °C. *m.*, 0.039, 0.042, 0.045, 0.075. The increase of the heat cond. no. of cork plates with the wt. per unit vol. has been observed by Poensgen. **Liquefaction of H.** MEISSNER.—With a Nernst app. and a Whitehead compressor about 0.5 l. per hr. were obtained. **Electrical work. Normal resistance.** FASSBENDER.—The new tubes of glass 59^{III} have been calibrated. Measurements with the normal resistances and duplicates (wire and Hg) show that an influence upon the resistance of 1 ohm by moisture cannot be confirmed. The measurements of 1910 on the Ag voltameter by v. Steinwehr are officially published. **Normal elements.** V. STEINWEHR.—Expts. on the manuf. by a chem. works of a normal element of Hg_2SO_4 have not led to definite results. Work has been continued by Warburg, Hupka, and Müller (cf. *C. A.* 7, 3700) on the detn. of the const. *c* of the **radiation law of black bodies.** It is pointed out that 0.5% error in the detn. of the ratio of the max. emissions at the m. p. of Au and 1400° introduces an error of 56 units in *c*. **Energy law of photochemical processes.** WARBURG. Cf. *C. A.* 8, 613; 9, 883, 2480.—The work on photochem. deozonization has been completed. O_3 solns. in O, N, and He were studied. The specific photochem. deozonization (= mol. O_3 destroyed/absorbed radiation) in dil. solns. (up to a concn. of about 0.5% of the concn. of pure O_3 under the normal conditions) is independent of the concn. and is greater with O_3 solns. in indifferent gases than with O_3 solns. in O_2, due to the secondary formation of O_3 from O and O_2. This is in general agreement with the Einstein law, but in concd. solns. the sp. photochem. deozonization is much greater than this law would indicate. Expts. on the photochem. ozonization of O_2 have been extended with an av. wave length of 0.253 μ. With an improved app. the earlier results have been confirmed; for λ = 0.253 μ the ozonization is considerably less than indicated by Einstein's law. **Positive rays.** GEHRCKE AND REICHENHEIM.—By the sepn. of a gas-charged space by means of a fine steel capillary into 2 separate spaces, the discharge and the observation spaces, anode rays were kept in the vacuum of the observation space and allowed to fall upon a photographic plate, giving sharp spots ("Flecke") by magnetic and elec. deviation, different from the parabolas found by J. J. Thomson and others with canal rays. The anode rays so formed are more homogeneous than the canal rays and suffer no appreciable loss of charge in their passage. Measurements of ϵ/μ and v are in progress. **Anode drop.** REICHENHEIM. Cf. *C. A.* 7, 3894; 8, 612, 1380.—Previous work has been continued. It is stated that with sufficiently small anode, small pressures and av. current strength, in pure gases (free from electronegative vapors) like H and He an abnormally high anode drop and formation of anode rays result. There is a complete

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parallel between the regularity of the anomalous anode and cathode drop. **Measurement of ϵ/μ on cathode rays.** GEHRCKE AND SEELIGER. Cf. *C. A.* 7, 3070, 3909; 8, 862.—The work previously reported on double metal layers in vacuum, in which an accurate measurement of potential differences between metals contained in gas were very difficult or impossible has been continued. Proper application of cathode dusting furnishes a means of destroying the double layer; measurements of the potential differences of metals are possible at certain times (dependent on exptl. conditions) after the dusting. **Light emission of metal vapors in the glow discharge.** JANICKI AND SEELIGER. Cf. *C. A.* 9, 15.—The excitation of light by cathode and canal rays in Cd vapor was studied. **Light excitation of gases by cathode rays.** SEELIGER. Cf. *C. A.* 8, 862.—A study was made to det. quantitatively the dependence of excitation upon the velocity of the rays. The method of measurement consisted in a direct photometric investigation of a beaming ray of sufficient homogeneity and intensity with simultaneous detn. of pressure, current strength and potential in the discharge tubes, in which the cathode ray is produced on a Wehnelt cathode. **γ-Rays.** GEHRCKE, GEIGER AND MEISSNER.—An investigation was made to det. whether hard γ-rays of Ra Em were bent by crystals, as is the case with Röntgen rays and very soft γ-rays according to the work of Rutherford. Rock salt, fluorspar, Au, or Bi crystals showed no indication of a bending effect, although well exposed dark spots of the γ-rays were obtained upon the photographic plate. Time of exposure varied from hrs. to weeks. The expts. were also executed at low temps., with crystals in liquid air and in liquid H, without any indication of bending or reflexion. **Testing of radioactive prepns.** GEIGER AND BOTHE.—Numerous Ra and meso-Th prepns. were examd. by comparing the γ-radiation of the prepn. with that of a standard prepn. Accuracy of method = about 0.5%. The total content of all prepns. examd. corresponded to about 2271 mg. Ra element. Seventeen feebly radioactive prepns. were tested in part by measuring the α-radiation, in part by detn. of Em content. These prepns. contained amts. of Ra of the order of magnitude of 10^{-5} to 10^{-4} mg. Ra element per g. of substance. **Method of counting α- and β-rays.** GEIGER, BODE AND CHADWICK. See *C. A.* 7, 3919. **Electrolytic valve action.** G. SCHULZE. See *C. A.* 7, 3914; 8, 1705, 2652; 9, 24, 1007. **Normal elements.** With the Clark element the deviations from 1.4324 v. at 15° varied from + 0.0004 to + 0.0007 v. With the internatl. Weston-Normal element (with excess of salt) the deviations from the normal value (1.0183 v. at 20°) were +0.0001 to + 0.0002 v. The Weston element with $CdSO_4$ soln. (satd. at 40) gave at room temp. deviations of +0.0003 to +0.0006 v. **The testing of lab. and other thermometers** (normal, meteorological, calorimeter, deep sea, etc.) is reported, giving number of tests made and accuracy required. A study of new thermometer glasses is in progress. **Electrical and optical temp. measurements.** HOFFMANN AND A. SCHULZE.—Tests reported on thermo-elements, using 2 elements of Pt-Pt-Rh from 0° to 1100° and 1 element of constantan-Ag at 600° as instruments of precision. Eight elements of constantan-Fe up to 800–900°, 2 of Ni-C up to 1200° were tested. Ni-Ni-steel (varying Ni content) and Ni-Ni-Cr are also being studied. Some of these elements at temps. up to 1000° are sufficiently accurate for technical purposes, though short-lived. A new radiation pyrometer was tested in which the total radiation is measured by the heating of a bolometer placed at the end of a cylindrical tube. Work has been started on the effective wave lengths of some recent color filters for optical-pyrometric purposes. A series of technically important quartzites has been studied in the Ir resistance furnace. Silite was tested as a heating body and gave very favorable results. **Chemical work.**—Methods for exam. of glass by MYLIUS (cf. *C. A.* 7, 3208; 8, 1000). **The analytical sepn. of the Pt metals without** soln. in molten Pb has been studied by Mylius and Mazzucchelli (cf. *C. A.* 9, 419), with a view of detg. the degree of purity of technical Pt. **Pt substitutes.** GROSCHUFF AND MYLIUS.—Ta crucibles and dishes showed slight wt. losses by the action of hot

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HCl or HNO_3; 10 times this loss by H_2SO_4 at 200°, complete destruction of the dishes by concd. KOH at 130°. So-called malleable W (comes under different names, *e. g.*, "Iridam," etc.), is too brittle for thin-walled vessels, and the material is attacked by HCl. Alloys, like nichrome, etc., gave no promise. Expts. are under way on other Fe alloys. After washing out for a yr., a flask of fine Ag was filled with H_2O and let stand 5 months; the soln. was decidely alk. to iodeosin, requiring 20 cc. of 0.001 N acid per l. for neutralization; addition of HCl gave a slight turbidity and light caused a violet coloration. The residue on evapn. gave 2.1 mg. of Ag, which had dissolved as Ag_2O. **Metal etching and coloring.** GROSCHUFF. See *C. A.* 8, 3770. $Ni(NO_3)_2.6H_2O$ was prepd. by recrystn. by Mylius and Hüttner with a Co content too small to verify. Groschuff and Mylius found as impurities in Kahlbaum's purest Bi: Ag 0.027, Pb 0.035, Cu 0.003, Fe trace (= 1 : 10^3 purity). Bi is best prepd. by Schneider's method, based on the repeated crystn. of $Bi(NO_3)_3.5H_2O$ from HNO_3, transforming by H_2O into the basic salt, igniting to Bi_2O_3 and reducing with H; a sample so prepd. showed max. impurities to Bi = 1 : 10^5. **Colorimetric detn. of metals** was studied by Hüttner and Mylius. For the detn. of Fe the most sensitive methods (thiocyanate and Berlin blue) are not always the most appropriate. A soln. of oxidized Fe in concd. HCl can be conveniently examd. colorimetrically, since the yellow color exists (contrary to H_2O solns. of $FeCl_3$) in great dilns. With ppts. containing, besides Fe_2O_3, Al_2O_3, SiO_2, ZnO, or MnO_2, alk. earths, etc., the colorimetric detn. of Fe is often convenient. A confusion with Cu, which also gives an intense yellow color in concd. HCl, is easily avoided. For the rapid examn. of Pt metals, a colorimetric process is used, *e. g.*, to det. Ir in a chloride soln. of com. Pt, mix pure Pt and Ir solns. till colors match.

F. W. SMITHER.

Vapor tension in ternary systems. I. W. P. JORRISEN. Leiden. *Chem. Weekblad* 11, 964–72(1914).—Schreinemakers has stated the rule that in ternary systems of the type H_2O–2 nonvolatile salts at const. temp. the vapor pressure of the soln. satd. with 2 salts is less than that of each of the binary satd. solns., for the case in which no hydrate is formed. If a hydrate sol. in H_2O without decompn. is formed, the pressure of each of the solns. satd. with hydrate and pure salt is less than that of each of the satd. solns. in the binary system, and also than that of the soln. satd. with pure hydrate. When the double salt is decompd. by H_2O, in addition to the above relations, the soln. satd. with hydrate and the salt which is not pptd. has a lower pressure than the soln. satd. with hydrate and the salt which is pptd. These rules are tested, most of the data being taken from the literature, although some detns. were made by J., and found to hold in every case. GEORGE W. MOREY.

Determination of vapor tensions at low temperatures. E. JIMENO GIL. *Anales soc. espaß. fis. quim.* 12, 469–82(1914).—G. discusses the results obtained in the detn. of vapor tension at low temps. The values obtained for each substance at the highest and lowest point of observation on the abs. scale are: EtOH, 0.00126 (173.1°) and 0.8349 (243.1°); Et_2O, 0.005156 (160.1°) and 0.6963 (195.1°); toluene, 0.00170 (183.1°) and 0.8937 (246.1°); Me_2CO, 0.00837 (180.1°) and 0.8763 (212.1°); AcOMe, 0.00354 (138.1°) and 0.6240 (213.1°). H. S. PAINE.

Vapor pressure of water between 40 and 100°. J. M. CRAFTS. *J. chim. phys.* 13, 105–61(1915).—Part I of the paper is a discussion of the data of Regnault, of Broch, and of Wiebe. No new data are taken, and only 8 pages are devoted to the subject mentioned in the title. The remainder of the paper is a discussion of the vapor pressure of H_2O between 135 and 230° as taken by various investigators, together with comparisons of the b. p. of H_2O with C_6H_6, *o*-toluidine, and other substances. Several formulas are suggested to represent the vapor pressure curves at various temps., but none of them is applicable over the whole range 20 to 40000 mm. E. B. MILLARD.

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Vapor pressures of acetylene, ammonia and isobutane at temperatures below their normal boiling points. G. A. BURRELL AND I. W. ROBERTSON. *J. Am. Chem. Soc.* **37**, 2482–6(1915); cf. *C. A.* **9**, 402, 2614.—The data cover the temp. range from the b. p. to 129.9° abs. for C_2H_2, and to 158° abs. for the other gases, with about 20 intermediate temps., using the same method as before. The exptl. values agree well with those calcd. from the Nernst equation: $\log P = (\lambda_0/4.571\ T) + 1.75 \log T - (\epsilon T/4.571) + C$. The av. heats of evapn. over the range studied, as calcd. from the Clausius-Clapeyron equation, are NH_3 6271 cal., C_2H_2 5152, and *iso*-C_4H_{10} 4828.

E. B. MILLARD.

Vapor pressure of thallium amalgams. JOEL H. HILDEBRAND AND E. D. EASTMAN. *J. Am. Chem. Soc.* **37**, 2452–9(1915); cf. *C. A.* **8**, 3734.—Vapor pressures of 11 amalgams contg. from 22.1 to 0.253 mols. of Hg per mol. of Tl have been detd. at about 325° by the method previously employed for Bi amalgams. The results are shown in a diagram in which p/p_0 is plotted against the mol. fraction of the amalgam. In all of the cases the v. p. is lower than that calcd. from the Raoult law in its simplest form. It was assumed that the compd. $TlHg_2$ was partly formed, thus decreasing the mol. fraction of the Hg and lowering the v. p. This assumption alone would not explain the deviation from the theoretical curve, but the existence of a compd. such as $TlHg_5$ would explain all the deviation in the dil. amalgam. The method previously used by Hildebrand (*C. A.* **7**, 2883, 3891), has been applied to the data of Richards and Daniels (*C. A.* **7**, 2353), and the conclusion reached that in the most concd. amalgams even $TlHg_2$ is somewhat dissociated. The deviations from Raoult's law are of the same type for both the e. m. f. data and the vapor pressure detns., the difference being due only to the different temps. at which the 2 sets of measurements were carried out.

E. B. MILLARD.

Covolume of gases evolved by explosives. D. BERTHELOT. *Compt. rend.* **161**, 209–11(1915).—The covolume, or *b* in van der Waals' equation, is about 0.001 of the sp. vol. of the gas at 0° and 1 atm. B. has discovered that the numerical ratio of the abs. crit. temp. to the crit. pressure in atms. is 1 : 4, as an av. value. The individual values range from 3.0 for H to 4.2 for N_2O. In polyatomic gases this ratio reaches much higher values, 19 for naphthalene, for example. There seems to be a real physical relation between the crit. temp. and the crit. pressure, since Onnes found for He a crit. temp. of 5.25° K. and a crit. pressure of only 2.26 atm. The gases mentioned are H, N, CO, O, CH_4, CO_2, N_2O, HCl and H_2O. Explosives are not discussed.

E. B. MILLARD.

Crystal structure. A. SCHOENFLIES. Frankfurt. *Z. Kryst. Min.* **55**, 545–69 (1915).—S. briefly states Groth's early theories of point systems, and Bragg's confirmation of the same, and discusses the conceptions of the fundamental unit of the space lattice and point system, concluding that the group of atoms, *G*, may form a point system and that these by movement along planes give the 32 classes. Each group demands that space be divided into ϕ units so that every operation on the group will alter each unit ϕ to a unit ϕ'. The atomic complex of each unit Γ may be unsymmetrical, but special cases may demand symmetrical atoms. The symmetry of the group *G* may be higher than that of the atoms ϕ. In each point system the number of units ϕ equals the *n*th part of the units Φ that make up the net work, where *n* equals the number of faces that belong to the simple crystal. Illustrations are discussed and many references given.

A. WANDTKE.

Topical parameters in the light of the stereo-hexite-pentite theory. W. ASCH AND D. ASCH. *Z. Kryst. Min.* **55**, 587–9(1915).—Topical parameters are a combination of crystallographic parameters and mol. valences. Structural formulas in the light of A. and A.'s theory are given for such salts as $(H_2KPO_4)_6$. It is shown that

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an *a priori* statement in the light of this theory, concerning the movements of mols. along certain directions in crystals has been substantiated by the work of Muthmann. (*Z. Kryst. Min.* **22**, 525(1894).) A. WANDTKE.

Rhythmic crystallization of sulfur. F. KOHLER. Charlottenburg. *Kolloid-Z.* **17**, 10–11(1915).—A commentary on an article by Fischer-Treuenfeld (*C. A.* **9**, 2831), showing 3 photomicrographs of thin layers of S which have crystd. so as to give a ridged appearance or, where there are more centers of crystn., an agate structure in which the outer rings become closer and closer together. To F.-T.'s explanation for this occurrence must be added the further condition that the viscosity of the liquid must be so great that the rate of flow toward the crystd. part is slower than the rate of crystn. Rhythmic crystn. is probably very common. H. I. MATTILL.

The dilution law. J. R. PARTINGTON. *Proc. Chem. Soc.* **30**, 251–2(1914).—The empirical law published by Kendall (*C. A.* **6**, 3043), $c\gamma^2/(1-\gamma) = K + k(1-\gamma)/\gamma$, is identical with that proposed by P. on theoretical grounds (*C. A.* **4**, 2402), which may be written in the form $c\gamma^2/(1-\gamma) = A + B.c\gamma$, where A and B are consts. The second term on the right of each eq. is a correction term, in the transformation of which it is legitimate to apply Ostwald's diln. law $(1-\gamma)/\gamma = K'c\gamma$. Then if $k = BK'$, the first 2 equations are identical. E. B. MILLARD.

Solution tenacity according to I. Traube. H. I. WATERMAN. *Chem. Weekblad* **11**, 577–9(1914).—An address delivered before the Delft Natuurwetenschappelijk Gezelschap, explaining the concept. of soln. tenacity ("Haftdruck") advocated by Traube (cf. *C. A.* **3**, 1485). GEORGE W. MOREY.

Complex ionization. IV. The assumption of "double complexes" applied to salts of copper, silver, cadmium, bismuth and iron in the refutation of Kahlenberg's criticisms of the ionization theory. C. BLOMBERG. Amsterdam. *Chem. Weekblad* **12**, 242–7(1915).—A discussion of the evidence brought forth by K. as contradictory to the ionization theory, in which it is pointed out that the discrepancies observed can be explained by the formation of complex ions. GEORGE W. MOREY.

Indexes of migration of the ions and transport of ammonia in ammoniacal solutions of silver nitrate. A. REYCHLER. *Bull. soc. chim. belg.* **28**, 215–22(1914).—R. has studied the electrolysis of ammoniacal $AgNO_3$ solns. in the Nernst-Loeb app. with Ag anode and Pt cathode. The usual $AgNO_3$ concn. was 0.25 N and the temp. was approx. 18°. When the mol. concns. of $AgNO_3$ and NH_3 were as 1 : 2 the indexes of migration of NO_3^- and Ag^+ were as 0.525 : 0.475, while 1.75 mol. NH_3 was transported by 1 atom Ag. When the mol. concns. of $AgNO_3$ and NH_3 were as 1 ; 2.2 the indexes of migration of anion and cation were as 0.52 : 0.48 and 1.9 mol. NH_3 was transported by 1 atom Ag. In order to avoid contact of the cathode and intermediate liquids with the anode during the removal of soln. after electrolysis a modification of the app. described by Ostwald-Luther was employed, thereby avoiding the error due to slow soln. of the Ag_2O coating of the anode in the ammoniacal liquid; the same temp. and abs. concn. of $AgNO_3$ prevailed as before. When the mol. concns. of $AgNO_3$ and NH_3 were as 1 : 2.2, 1 : 2 and 1 : 1 the indexes of migration of NO_3^- and Ag^+ were as 0.55 : 0.45, 0.54 : 0.46 and 0.54 : 0.46, resp., while the corresponding number of mols. of NH_3 which were transported by 1 atom Ag were 1.9, 1.8 and 0.86, resp. (use of the modified app. throughout). When no NH_4OH was added the indexes of migration of NO_3^- and Ag^+ were as 0.52 : 0.48. The presence of NH_3 apparently tends to increase the rate of migration of the negative ion to a slight extent. The amt. of NH_3 transported by 1 atom of Ag depends on the alkalinity of the soln. It is concluded from the above data that the complex ion $Ag(NH_3)_2$ is transported as such with the current. This view is in accord with the following facts: (1) NH_4OH in practically the ratio of 2 NH_3 : 1 Ag

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may be added to a $AgNO_3$ soln. without causing an ammoniacal odor; (2) a soln. which contains 2 mols. NH_3 to 1 mol. $AgNO_3$ has practically the same absorbing power for NH_3 vapor as has pure H_2O; (3) the cryoscopic behavior and elec. cond. of the preceding soln. are practically the same as though NH_3 were not present; (4) the formulas $Ag(NH_3)_2NO_3$, $Ag(NH_3)_2Cl$, etc., are confirmed by the study of certain concn. cells. Even in very ammoniacal solns. $AgNO_3$ does not exist exclusively in the form of the complex $Ag(NH_3)_2 \ldots NO_3$, since a small proportion of the mols. $Ag \ldots NO_3$ are also present; the equil. may be expressed according to the law of mass action by $k[Ag(NH_3)_2] = (Ag)(\text{free } NH_3)$. When NH_3 is not in excess the NH_3-free ions become much more numerous and the inter-ionic equil. assumes a more complicated form. In view of the similarity of H_2O and NH_3 as solvents and the observation that NH_3 is often replaceable by H_2O in ammoniacal complexes of Co, Cr, Pt, and even Cu, R. believes that combinations such as $Ag(NH_3)(H_2O)$ and $Ag(H_2O)_2$ may also occur. The fixation of 2 mols. of H_2O or NH_3 is regarded as the 1st phase in the mobilization of the metallic ion. The complexes in the question are too unstable to warrant a discussion of the question whether the 2 NH_3 groups which are attached to the same Ag atom play exactly the same role. R. discusses the general question, however, in connection with the salts of the cobaltamines and takes issue with Werner on certain points.

H. S. Paine.

Ionization in solvents of low dielectric constant. W. E. S. Turner. *Chem. News* **112**, 151–2(1915); cf. Sakhanov, *Z. physik. Chem.* **87**, 441(1915).—S. argued from cond. detns. that the dissociation of one electrolyte in a solvent of low dielectric const. is materially increased by the addition of a 2nd electrolyte. T. has performed expts. on the f. ps. of solns. of $(C_5H_7)_4NI$, NEt_2H_2Cl, Et_3HNBr, $PhEtNH_2I$, $PhEt_2NHI$, $PhEtNH_2Cl$ and $PhEt_2NHCl$ in $CHCl_3$, from which it is shown that the opposite is the case. In all of these solns. the degree of association is increased. The mol. cond. of solns. decreases as the av. size of the electrolyte mols. decreases, just the opposite of the behavior in H_2O. No data are given, and the exptl. method is not described.

E. B. Millard.

Molecular state of salts in solution. W. E. S. Turner and J. D. Cauwood. *Chem. News* **112**, 152(1915).—Previous work (*C. A.* **5**, 2997) on the association in $CHCl_3$ of haloid salts of organic ammonium, sulfonium and oxonium bases has been extended to metallic salts. A new series of salts has been prepd., and all of them have high mol. wts. in $CHCl_3$. At 25 mg.-mols. per 100 cc. of solvent, the degree of assoc. increases in the order: iodate, oxalate, chloride, bromide, bromate, chlorate, sulfate, iodide, benzoate, nitrate, periodide, thiocyanate, fluoride of a tetrapropylammonium base. The observed mol. wt. of the thiocyanate, *e. g.*, was 7 times the calcd. mol. wt. No details of the expts., and no data are given.

E. B. Millard.

Dissociation of water in salt solutions. W. Palmaer and K. Melander. *Z. Elektrochem.* **21**, 418–25(1915).—The dissoc. has been measured from the e. m. f. between 2 H electrodes immersed in salt solns. of different concns. in which the concns. of H^+ are also different. (Cf. Poma and Tanzi, *C. A.* **6**, 1562.) Salts which show a cond. max. were chosen (LiCl and $CaCl_2$), since in such very concd. solns. the liquid potential could be (approx.) eliminated. Further, a very concd. soln. could be measured against a much weaker (total) concn. having the same cond. and hence approx. the same ion concn. A 11.8 *N* soln. of LiCl was measured against 1.5, 1.8, 3.0, 5.7, and 7.2 *N* solns. at 22°, and a 10 *N* soln. of $CaCl_2$ against 0.65, 1.5, 2.18, 2.5, 4.0 and 5.07 *N* solns. at 25.5°. From kinetic considerations it was shown that the p. d. between 2 solns. of equal ion concns. but different total concns. should be zero when the ion pressure is the same in both solns. In a 11.8 *N* soln. of LiCl there is 240 times as great a concn. of H^+ as in 1.5 *N* solns. of the same salt, and between 10.0 and 1.7 *N* $CaCl_2$ the

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ratio is 235. The results are only approximate. Pure electrolytic H was used in the expts. and the app. was the same as that used by Melander, *Arkiv. för Kemi* 5, 7(1914).
E. B. MILLARD.

Cases of complex ionization with two complex ions. C. BLOMBERG. *Z. Elektrochem.* 21, 437–9(1915).—The usual increase in mol. cond. with diln. does not take place with Mg citrate, and this salt is the only one of Mg which does not have the characteristic bitter taste, even in 2*N* soln. Other Mg salts have a bitter taste in 0.1 *N* solns. The following scheme is proposed for its ionization (Ci represents the citrate ion): $Mg_3Ci_2 \rightleftharpoons (Mg_2Ci)^+ + (MgCi)^-$, followed by the secondary ionizations $(Mg_2Ci)^+ \rightleftharpoons Mg^{++} + (MgCi)^-$ and $(MgCi)^- \rightleftharpoons Mg^{++} + Ci^{---}$. Similar hypotheses are proposed, especially for the basic acetates of Pb. By assuming the association of an elementary ion with an undissoc. mol., it is possible to have strong solns. of electrolytes contg. only small concns. of elementary ions, as in $Pb(OAc)_2$, $CdSO_4$ and the citrates of Fe and Mg. Abnormal values of "*i*" are obtained in all these cases. Abnormal solubility relations may be explained in this manner, since an insol. substance *AB* may dissolve in solns. contg. either *A* or *B*. The results of Kahlenberg (1901) with $CuSO_4$ were explained by assuming $3CuSO_4 \rightleftharpoons [Cu_3SO_4]^{++} + [Cu(SO_4)_2]^{--}$.
E. B. MILLARD.

Molecular conductivities of iodoanilinesulfonic acids. MARY BOYLE. *Proc. Chem. Soc.* 30, 161–2(1914).—The following monoiodoanilinesulfonic acids have been prepd. and the conds. of their aq. solns. at 25° detd.: 2-, 3-, and 4-iodoaniline-6-sulfonic acids, 2-, 3-, and 4-iodoaniline-5-sulfonic acids, and 2-, and 3-iodoaniline-4-sulfonic acids. In all cases where I is introduced into an ortho-position to the amino group, a very considerable increase in mol. cond. occurs. The increase is much less marked in the case of the *m*- and *p*-iodo-substituted acids.
E. B. MILLARD.

Reactions of both the ions and the molecules of acids, bases and salts. Reaction of sodium ethylate with ethyl bromide and ethyl iodide in absolute ethyl alcohol at 25°. E. K. MARSHALL, JR. AND S. F. ACREE. *J. Phys. Chem.* 19, 589–608(1915); cf. *C. A.* 9, 544, 2018, 2343.—Using the method which has been described before, M. and A. have detd. the velocity of the reaction between NaOEt and EtI or EtBr in absolute alc. at concns. of *N* to 0.0625 *N*. The alkyl halide reacts with both the ethylate ion and the non-ionized NaOEt according to the equation $K_n = K_i\alpha + K_m(1-\alpha)$ where the consts. have the values $K_i = 0.00576$ and $K_m = 0.00233$. These values agree closely with those of J. P. Harrison (as yet not published in detail), namely 0.00557 and 0.00232, resp. Each alkyl halide has its own value for K_i, whatever the phenolate or ethylate used, but the nonionized ethylates and phenolates react with different velocities with the same alkyl halide, in conformity with the theory. The ions and unionized mols. may undergo transformations with comparable velocities, though these reactions may be influenced by "salt-effects" and other physical factors; these are being investigated.
E. B. MILLARD.

Ionization potentials of mercury, cadmium and zinc, and the single- and many-lined spectra of these elements. J. C. MCLENNAN AND J. P. HENDERSON. *Proc. Roy. Soc. London* (*A*) 91, 485–91(1915); cf. Frank and Hertz, *Verh. deut. physik. Ges.* 10, 457–67.—Expts. in a special quartz app. showed that the vapors of Cd and Zn, as well as that of Hg, can be stimulated to the emission of single-line spectra when traversed by electrons possessing the requisite amt. of energy. For Cd the wave length of this single line is λ3260.17 Å, and for Zn λ3075.99 Å. It follows from the quantum theory that the minimum ionizing potentials for these vapors are, resp., 3.74 and 3.96 v. The corresponding wave length and ionization potential for Hg are 2536.72 Å and 4.9 v. Some support to Thomson's theory of 2-type ionization of Hg has been obtained, and some considerations are given which show that the same theory is applicable to the ioni-

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zation of the atoms of Zn and Cd as well. The minimum arcing p. ds. which will bring out the many-lined spectra for Hg, Zn and Cd are, resp., 12.5, 11.8 and 15.3 v. These voltages are probably also the minimum ionization potentials of the 2nd type for the atoms of these 3 elements. Possibly the spectrum of an element can be analyzed in such a way as to correlate different portions of the spectrum with disturbances in definite portions of the atomic structure of that element. E. B. MILLARD.

Hydrogen- and hydroxyl-ion activities of solutions of hydrochloric acid, sodium and potassium hydroxides in the presence of neutral salts. H. S. HARNED. *J. Am. Chem. Soc.* 37, 2460–82(1915).—The expts. are on the e. m. f. of cells Hg | HgCl | KCl-(*M*) | satd. KCl | HCl(0.1 *M*) | H_2 at 25°, when LiCl, KCl, NaCl, $BaCl_2$, $SrCl_2$ and $CaCl_2$ have been added to the HCl in the H_2 electrode in 0.1 *M* concns. The LiCl soln. was also measured with a 0.1 *M* HgCl electrode; the e. m. f. obtained agreed with that of Loomis and Acree (*C. A.* 6, 823). Attempts to use $NaNO_3$ as the added salt were unsuccessful, but a series was obtained in which mannitol was added. The results are shown in a plot of concn. of added salt against change of e. m. f. in the cell. In every case there was a decrease in the e. m. f., while the law of mass action demands an increase on account of the decreased H^+ concn. due to the added common ion. This drop was not due to the change of the liquid potential following the addition of a salt having a slower cation than anion. In a second series of expts. the cells Hg | HgCl | KCl(*M*) | satd. KCl | NaOH (0.1*M*) | H_2 and Hg | HgCl | KCl (0.1*M*) | satd. KCl | KOH(0.1*M*) | H_2 have been made, with the addition of LiCl, KCl or NaCl to the soln. in the H_2 electrode. In this case too the addition of a salt increases the activity of OH-in the soln. The increase in activity of H^+ in the acid-salt system differs little for the different salts, but this does not hold for the hydroxide systems. If the interpretation of the data is correct, the H^+ concn. in a 0.1*M* soln. of HCl has been increased from 0.092 to 0.1765 by the presence of 3 *M* KCl. The soln. acts as if it were contracting, or as if the vol. of the solvent had decreased. Calcns. from Planck's formula for potential junctions confirm the exptl. values. E. B. MILLARD.

Dilatation of solutions. B. CABRERA. *Anales soc. espaň. fis. quim.* 12, 284–95 (1914).—The d. and dilatations of solns. of $NiCl_2$, $NiSO_4$ and $Ni(NO_3)_2$ are given. The amt. of salt dissolved in 1 g. of the soln. may be expressed by the formulas: $1.0547\ (D_s - D_{aq.})_{15°} - 0.557\ (D_s - D_{aq.})^2_{15°}$ for $NiCl_2$; $0.9519\ (D_s - D_{aq.}) - 0.559\ (D_s - D_{aq.})^2_{15°}$ for $NiSO_4$; and $1.1853\ (D_s - D_{aq.})_{15°} - 0.765\ (D_s - D_{aq.})^2_{15°}$ for $Ni(NO_3)_2$. H. S. PAINE.

The influence of the nature of the adsorbent in the adsorption from aqueous solutions. H. FREUNDLICH AND A. POSER. *Kolloidchem. Beihefte* 6, 297–328(1914). —The adsorption of acid dyestuffs and alkali dyestuffs by "Fasertonerde" (Al_2O_3 of H. Wislicenus), bole (Merck's "Prof. Stumpfs' sterilisierter Bolus") and blood charcoal (Merck's "Carbo sanguinis") was detd. to note if there is any law governing the adsorption of a negative or positive substance by the positive Al_2O_3, the negative bole (clay) and the neutral charcoal. The adsorptions were carried out at room temp. in glass-stoppered bottles and of each dyestuff 50 cc. of 3 concns. (0.1%, 0.05% and 0.025%) were used. The change in concn. was detd. by titrating according to the method of L. Pelet and V. Garuti (*C. A.* 2, 324). The adsorption of salts of alkaloids and ptomaine by the same adsorbents was also investigated. The analytical detns. were made with the Zeiss water-interferometer. Except in the case of strychnine nitrate the results could be expressed by the adsorption iostherm $a = \alpha C^{1/n}$. The often accepted law that a positive adsorbent adsorbs only negative substances and *vice versa* does not apply in general. The positive Al_2O_3 noticeably adsorbs basic dyestuffs. Chrysoidine is strongly adsorbed while methylene green, safranine and methylene blue are less adsorbed. This is explained by considering an ordinary adsorption together with an electrochem.

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adsorption (adsorption of ions.). In expts. to note the adsorption of colloidal As_2S_3 and $Fe(OH)_3$ by the same adsorbents the above equation does not explain the results. A given amt. of adsorbent adsorbed a const. amt. of colloid regardless of the concn. The positive Al_2O_3 adsorbed only the negative As_2S_3, the negative bole adsorbed only the positive $Fe(OH)_3$, while the charcoal adsorbed both. In the investigation of the adsorption of mixts. of benzoic and salicylic acids in H_2O solns. by the charcoal and Al_2O_3 the results agree with those of Michaelis and Rona (*C. A.* **3**, 1423). It was further found that the total adsorption of both acids in the same soln. was practically the same as if one of the acids were used in the same concn. W. F. ZIMMERLI.

Asymmetry in the rate of solution of crystals on different faces. J. LEBRUN. *Bull. sci. acad. roy. belg.* **1913**, 953–79.—After a review of the literature regarding this subject L. discusses the theories of Noyes and Whitney, Nernst and Brunner, and Berthoud regarding the rate of soln. in heterogeneous systems. The origin of corrosion and convection figures due to action of solvents on crystal surfaces is also discussed. In order to study the dependence of the rate of soln. upon the nature of the crystal surface, crystals were imbedded in paraffin so that only a definite area of the surface to be investigated was exposed. These crystals were then immersed in H_2O at const. temp. for a definite time after which they were dried and weighed; the rate of soln. of the salt for this particular crystal surface was then detd. from the loss in wt. The rates of soln. (at 25°) of $NaNO_3$ for the crystal surfaces $(10\bar{1}1)$, (0001) and $(\bar{1}2\bar{1}0)$ were as 11.8, 10.8 and 10.7, resp. The rates of soln. for the various crystal faces were practically identical in the case of $MgSO_4.7H_2O$. Considerably greater differences were observed in the case of the soln. of quartz in HF. In the case of a HF soln. of definite concn. quartz was dissolved in the relative amounts 7.2, 1.15, 1.17 and 0.97 from the crystal faces (0001), $(11\bar{2}0)$, $(10\bar{1}0)$ and $(10\bar{1}1)$, while in the case of a HF soln. of different concn., the amts. which were dissolved for the corresponding faces were as 18.76, 4.37, 4.41 and 3.7. L. explains these differences in rate of solubility on the basis of the Berthoud theory. H. S. PAINE.

Variation of the cryoscopic constant with the molecular weight of the solvent. J. DE GUZMÁN CARRANCIO. *Anales soc. espaü. fis. quim.* **13**, 89–98(1915); *J. Chem. Soc.* **108**, II, 222.—C. gives a series of tables showing the value of the cryoscopic const. for a number of solvents. The results indicate that increase in mol. wt. for compds. of the same series is attended by an increase in the cryoscopic const. This const. also appears to be a periodic function of the elements, since it increases with augmentation of the at. wt. for the elements of the same group. H. S. PAINE.

Density and viscosity of aqueous solutions, with special reference to nitric acid. I. Densities. W. R. BOUSFIELD. *J. Chem. Soc.* **107**, 1405–26(1915).—Densities of 6 solns. of HNO_3 between N and $N/32$ have been detd. at 4, 11, 18 and 25° in special pycnometers. The strengths of the solns. were detd. by titration. A "contraction function" is then defined as $X = V((d/d_w) - 1)$, where V is the vol. contg. one equivalent, d is the density of the soln. and d_w that of H_2O at the same temp. The function is then defined in terms of the Bousfield H, which is independent of the temp., and a detailed discussion is given of the data, and other data on sucrose and H_2SO_4 (taken from Landolt and Börnstein's tables). Cf. *C. A.* **8**, 285, 2093, 3258, 3390.
E. B. MILLARD.

Capillary constants for liquid carbon monoxide and liquid argon. A correction. C. A. CROMMELIN. *Proc. Chem. Soc.* **30**, 248(1914).—Correction of the data of Baly and Donnan (*J. Chem. Soc.* **81**, 907(1902)). The corrections for A have already been published by G. Rudorf (*Ann. Physik* **20**, 751(1909)), but complete tables are also given here. E. B. MILLARD.

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Solubility of silver oxide in water. G. Rebière. *Bull. soc. chim.* 17, 309–12 (1915).—Samples of Ag_2O were prepd. from NaOH and $AgNO_3$, NaOH and AgCl, $Ba(OH)_2$ and $AgNO_3$, and NaOH and Ag_2CO_3. The first 2 samples were velvet brown, the others were black. Samples of each kind were agitated with H_2O in a thermostat for 2 hours at 25° and 50°, and the concn. of each soln. was detd. by titration. The solubilities at 25° were, in the order mentioned, 2.16, 2.23, 2.32 and 2.95 × 10^{-4} mols. per l., and at 50°, 2.27, 3.09, 3.55 and 3.89 × 10^{-4} mols. per cc. [The first value for 50° is possibly a misprint, the wt. of Ag_2O from which it was calcd. corresponds to 2.99 × 10^{-4}.—Abstr.] The value for 25° found by Noyes and Kohr was 2.16 × 10^{-4}. (*J. Am. Chem. Soc.* 24, 1141(1902).) E. B. Millard.

Influence of hydroxylic compounds on the solubility of mercuric chloride in water. E. Moles and M. Marquina. Madrid. *Anales soc. espaß. fis. quim.* 12, 383–93 (1914).—M. and M. have studied the influence of glycerol, sucrose, and tartaric and citric acids on the solubility of $HgCl_2$ in H_2O. The H_2O which was employed was distd. several times with $KMnO_4$ and $Ba(OH)_2$. The solns. were prepd. in all cases by taking H_2O and glycerol, sucrose, tartaric acid or citric acid in varying proportion so that the total wt. was always 100 g.; an excess of dry, pulverized $HgCl_2$ was then added and the mixt. was kept at a const. temp. of 25° ± 0.02 until the solvent was satd. The amt. of $HgCl_2$ present in a weighed portion of the filtered soln. was detd. by pptn. as HgS. It was ascertained that the added substances, especially glycerol, did not interfere with the accurate detn. of $HgCl_2$. The solubility of $HgCl_2$ in H_2O was increased by the addition of glycerol and sucrose and diminished by the presence of citric and tartaric acids. $HgCl_2$ crystd. from all the solns. on cooling. The crystals which sepd. from the glycerol-H_2O mixts. were especially remarkable for size; these prismatic crystals increased in size with the amt. of glycerol present. It was impossible, however, to cause the sepn. of crystals from pure glycerol; on cooling the liquid became quite turbid and gelatinous. The crystals which sepd. from a soln. of 75% glycerol and 25% H_2O were allowed to drain for a considerable period *in vacuo* and were then washed on a glass-wool filter with distd. H_2O and dried at 60°; analysis indicated the compn. $HgCl_2$. The rapid increase in solubility of $HgCl_2$ with increase in content of glycerol suggested the formation of a complex (*e. g.*, such as occurs in the case of H_3BO_3). The sp. elec. cond. was found to decrease with increase in concn. of glycerol in spite of the greater amt. of $HgCl_2$ which was present in soln.; no sudden increase in cond., such as would indicate the formation of a complex was observed. Formation of HgCl or Hg oxychloride by reduction was not observed in any of the solns. This contradiction between the results of M. and M. and those of Dott and H. Ley (who observed reduction of $HgCl_2$ by tartaric acid and sucrose, resp.) is probably due to the fact that the former used satd. solns. which were little exposed to the action of light. The solubility of $HgCl_2$ in pure H_2O was found to be 0.281 mole per l. at 25° which agrees well with the measurements of Foote, Hannay, Herz and Anders and fairly well with those of Morse, Sherrill, Zander and Etard. The solubility of $HgCl_2$ in pure glycerol was found to correspond to the ratio of 1 pt. $HgCl_2$ to 1.25 pt. glycerol at 25° as compared with 1 pt. $HgCl_2$ to 14 pts. glycerol at ordinary temp. as recorded by Fairley. This wide difference cannot be explained by difference in temp.: the value of Fairley which is quoted in many text books should be discarded. Bodländer's relation $W/\sqrt[3]{S} = C$ (W = amt. of H_2O and S = amt. of substance dissolved in 100 cc. of soln.) was tested with negative results in the case of the solns. which contained citric and tartaric acids. The Herz and Anders relation $(S + A)G/(S + A + G) = C$ (S = amt. of dissolved substance and A and G = the amts. of H_2O and glycerol, resp., in 100 cc. of the soln.) was only partially verified and only held rigorously within narrow limits in the case of mixts. of glycerol and H_2O. The solubility curve for $HgCl_2$ in glycerol-H_2O mixts. was quite analogous

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to that obtained from Herz and Anders' data for $HgCl_2$ in mixts. of H_2O and EtOH or MeOH and also to that of Herz and Koch for $Ca(OH)_2$ and $Ba(OH)_2$ in glycerol-H_2O mixts. Alcohols in general increase the soly. of $HgCl_2$ in H_2O. This influence is possessed by many ketone or aldehyde alcohols (certain sugars). The solubility of $HgCl_2$ in aq. sucrose solns. is almost proportional to the concn. of sucrose. The decreased solubility of $HgCl_2$ in aq. tartaric and citric acid solns. is attributed to the influence of the CO_2H group. H. S. PAINE.

Mutual activation. H. J. PRINS. *Chem. Weekblad* 11, 784–90(1914).—A discussion of the activation theory of catalysis, especially as applied to autoöxidation. GEORGE W. MOREY.

Colloidal catalysts. P. E. VERKADE. *Chem. Weekblad* 11, 596–9(1914).—An address delivered before the Delft Natuurwetenschappelijk Gezelschap. G. W. M.

Chemical reactions in colloidal media. H. C. JACOBSEN. *Chem. Weekblad* 11, 588–93(1914).—Address delivered before the Delft Natuurwetenschappelijk Gezelschap. GEORGE W. MOREY.

Osmotic pressure of colloidal solutions. W. D. COHEN. *Chem. Weekblad* 11, 585–7(1914).—An address delivered before the Delft Natuurwetenschappelijk Gezelschap. GEORGE W. MOREY.

Pyrosols. C. J. VAN NIEUWENBURG. *Chem. Weekblad* 11, 602–4(1914).—An address delivered before the Delft Natuurwetenschappelijk Gezelschap. N. believes that the "metallic clouds" described by Lorenz (*C. A.* 9, 1565) are not colloidal solns. of the metal in the molten salt, but merely a macroscopic emulsion of small particles of the metal, formed because of the limited soly. of the metal in the molten salt. GEORGE W. MOREY.

Theory of van Hatschek concerning the viscosity of colloids. A. VAN ROSSEM. *Chem. Weekblad* 11, 579–84(1914).—An address delivered before the Delft Natuurwetenschappelijk Gezelschap, dealing with the viscosity of colloidal solns. and the formula of van H. (cf. *C. A.* 6, 3873). GEORGE W. MOREY.

Colloidally dissolved and gelatinous carbon. N. L. SÖHNGEN. *Chem. Weekblad* 11, 593–6(1914).—An address delivered before the Delft Natuurwetenschappelijk Gezelschap, in which the various attempts to prepare colloidal C are discussed. The conclusion is drawn that a colloidal soln. of C has never been obtained. GEORGE W. MOREY.

The colloid in clay. P. EHRENBERG AND G. GIVEN. Göttingen. *Kolloid-Z.* 17, 33–7(1915).—By treating 3 kg. purified (acidified and washed) clay with 500 l. H_2O and 250 cc. NH_4OH and allowing to stand at nearly const. temp. for 6 months, a slightly opalescent supernatant liquid was obtained which under the ultramicroscope showed particles calcd. by Zsigmondy's method to be 140 $\mu\mu$. This value is only approx. and is probably too high because of the emulsion character of the colloid. The colloid is not deposited by centrifugalizing and when sepd. from the soln. by Zsigmondy's ultrafilter gives a sticky, almost transparent horny mass. This is present in the clay to the extent of about 1% and is of great importance in the binding properties of the clay. H. I. MATTILL.

Organosols of the metals and hydroxides of the platinum group. III. C. AMBERGER. Erlangen. *Kolloid-Z.* 17, 47–51(1915).—Practically all previous prepns. of colloidal Os have resulted in a colloidal oxide or hydroxide. A. has prepd. organosols of Pt and Pd (*C. A.* 8, 1367, 1368) in wool fat, and now applies the same principle to the prepn. of colloidal Os. Two parts of OsO_4 are dissolved in 7 parts dil. NaOH and alc. added till Na_2OsO_4 is formed. This is gradually stirred into 13 parts of warm wool fat, intimately mixed, then $N_2H_4.H_2O$ is added slowly; the emulsion swells and

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takes on a metallic gray color and on standing 24 hrs. becomes black. Another warming and the addition of more $N_2H_4.H_2O$ are necessary for complete reduction. To remove the by-products this may be dissolved in petr. ether, washed, dried and the ether distd. off. There results a brown-black salve, easily sol. in org. liquids which dissolve wool fat, giving transparent, brownish black liquids. For analysis this salve is dissolved in petr. ether, pptd. by more than an equal volume of alc. and Os detd. in the dry ppt. by the method of C. V. Knorre (*Z. angew. Chem.* **15**, 393(1902)). Os = 7.9%. This contains oxides of Os as well as metallic Os. In order to reduce the colloidal oxides the original emulsion, after reduction with $N_2H_4.H_2O$, is dissolved in petr. ether and pptd. by alc.; neary all the Os ppts. in combination with a large proportion of the wool fat. This coagulum is washed free from alkali, dried, powdered and then reduced with dry H first in the cold then at 30–50°. This gives a stable organosol, easily sol. in liquids which dissolve wool fat. Os = 20.97%. If instead of reducing the Na_2OsO_4 wool fat emulsion with $N_2H_4.H_2O$, 15% H_2SO_4 is added, an organosol of OsO_2 is formed, 1 prep. of which gave 9.53% OsO_2. The OsO_2 concn. in this may be raised by dissolving in petr. ether and pptg. with alc., then washing. OsO_2 = 24.5%. H. I. MATTILL.

The peptization of chromic oxide. WILDER D. BANCROFT. *Trans. Am. Electrochem. Soc.* **28** (advance copy) (1915); cf. F. NAGEL, JR. *C. A.* **9**, 1571.—Fischer and Herz (1902) had found that a soln. of chromic hydroxide behaves like a typical colloid. B. attacks the conclusions of F. and H. regarding conductivity, etc., and, with C. F. Nagel, carried out a series of tests. These show that using a collodion ultrafilter it is possible to filter out the hydrous chromic oxide peptized by caustic alkali. On long standing, nearly all of the peptized chromic oxide ppts. from a caustic alkali soln. Chromic chloride solns. peptize hydrous chromic oxide. No appreciable amt. of basic chloride appears to be formed. It is not possible to shake out hydrous chromic oxide from an alk. soln. either with C_6H_6 or kerosene, even though C_6H_6 will remove hydrous chromic oxide from water. Since hydroxyl ions are the active peptizing agents with hydrous chromic oxide a strongly adsorbed cation will decrease the stability of the colloidal soln. The order of decreasing stability is K, Na, Ba, Fe. C. G. FINK.

Period of induction and passivity of zinc. M. TZENTNERSHVER AND J. DRUCKER. *J. chim. phys.* **13**, 162–95(1915).—Chem. induction is "any action by means of which the resistance to combination is decreased, or an action by which a more ready state of combining power is produced." The expts. are on the speed of soln., of Zn in H_2SO_4 or HCl of various concns.; on the influence of the condition of the surface and the structure of the metal on this speed of solution; and on the effect of the "state" of the metal, *i. e.*, whether it is "active" or "passive." The theory of local (elec.) currents is rejected entirely. In the first period of soln. a metal is passive, and as the speed of soln. becomes greater the metal becomes more active, *i. e.*, its greatest "activity" is shown when the speed of soln. is a max. (*C. A.* **8**, 2834.). The period of induction of Zn is explained by its passage from the active to the passive state, and depends on the nature and concn. of the acid employed. Its activity is governed by the condition of the surface; it is increased by a preliminary heating, and the oxidation of the surface is not the cause of this increased activity. Some salts ($FeSO_4$) accelerate catalytically the process of soln. Amalgamated Zn is passive. Active Zn has a greater potential than passive Zn. Zn becomes passive under the influence of anodic polarization and active under that of cathodic polarization. This is said to confirm the analogy between the phenomena of passivity for Fe and Zn. E. B. MILLARD.

Heat. (A) High temperature and general work, (B) thermometer testing. HARKER, KAYE, *et al. Report Nat. Physical Lab.* **1914–5**, 56–69.—Proceeding toward the international adoption of a standard temp. scale the centigrade thermodynamic scale was adopted, with the H thermometer as a working scale between the f. p. and b. p.

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of H_2O and these temps. as fixed pts., with the Pt resistance thermometer between the f. p. and b. p. of S, with the latter point as 444.5° in a specified form of app., and under specified conditions. The b. p. of S at p mm. pressure is connected with that at standard pressure by the formula $T_s = 444.5° + 0.0908(p - 760) - 0.000047(p - 760)^2$. In addition to these fundamental points, the following were adopted: b. p. of O —182.9₅° + $0.01258(p - 760) - 0.0000079(p - 760)^2$, b. p. of CO_2 —78.5° + $0.01595(p - 760) - 0.0000111(p - 760)^2$, f. p. of Hg —38.88°, transformation p. of Na_2SO_4 32.38₄, b. p. of $C_{10}H_8$ 217.9₆ + $0.058(p - 760)$, b. p. of benzophenone 305.9° + $0.063(p - 760)$, m. ps. of Sb 630°, Ag (in a reducing atm.) 961°, Au 1063°, Cu (in a reducing atm.) 1083°. Fixed points of the second order are provided by the m. p. or f. p. of Sn 231.8°, Cd 320.9°, Zn 419.9° and "common salt" 801°. Details are given of the comparison of 2 P. T. R. resistance thermometers in which the variations from the mean are about 0.003° on the av. Comparisons between Hg thermometers and Pt resistance thermometers have been made between 200 and 500° and will be published shortly.

E. B. Millard.

Hypothesis relating to the specific heat and plasticity of metals. F. Skaupy. *Verh. deut. physik. Ges.* **17**, 269–70(1915).—From the sp. heats of metals at various temps., Nernst concluded that either free electrons are present in only small concn. in metals or that the gas laws did not apply to these electrons. S. is inclined toward the second alternative, for the following reasons: When the dissociation of an atom takes place in a metal, not only an electron but the corresponding atom-ion is formed, and each finds itself in a "free" gas-like condition and possesses a mean kinetic energy equal to the mean energy of the unelectrified atom in the space lattice. At sufficiently high temps. (so there is no appreciable quantum effect), the sp. heat of the atom-ions and of the electrons is $3/2\ R$ for each, if only 1 electron is sepd. per atom. The heat capacity is the same as that of the atoms held in the space lattice and undissoc. This affords an explanation of the observed fact that the sp. heat of highly dissoc. metals is not greater than $3R$. At such high temps. the electrons and positive ions have the same energy as the atoms of a monoatomic gas; and deviations are first experienced at low temps. where a modification in the energy of the vibrating atom in the crystal lattice is experienced on account of the quantum effect. The positive atom-ion cannot remain in the lattice, according to the argument presented. This assumption of "free" atom-ions also throws light on the plasticity of metals. The presence of a large number of atoms in a homogeneous lattice, and the dissociation and recombination which continually lifts them out of the space lattice and replaces them in it must lead to an enormous increase in the number of displacement planes, and hence to an increase in the plasticity of the metal. The conclusion seems to be correct for the electropositive alkali metals. In cases in which the atom splits off more than one electron, the sp. heat should be greater than $3R$.

E. B Millard.

Heat conductivity of dissociated gases and the dissociation of hydrogen into atoms. Teofilo Isnardi. *Z. Elektrochem.* **21**, 405–17(1915).—A Pt wire was supported in the axis of a cylindrical glass tube and electrically heated. The p. d. between the ends of the wire, the current, and the resistance were detd. after the wire had come into equil. with the surrounding gas (I vapor). The dissoc. of I_2 into atoms has been studied by Bodenstein and Starck (*Z. Elektrochem.* **16**, 161(1910)), and their values of the dissoc. were used. The heat losses from the Pt wire can be calcd. by means of the equation of Nernst (1905), and the results of these calcns. agree with the exptl. data taken. The mathematical theory is fully discussed in the paper, but cannot be briefly abstracted. From this theory and the exptl. data of Langmuir (*C. A.* **8**, 3255; **9**, 985) on the heat losses from a hot wire in H, the degree of dissociation of H at 25, 50 and 100 mm. Hg has been calcd. for various temps. between 1600 and 3100° abs.

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The heat of dissoc. is 95000 cal. ± 2 to 3%. This value agrees with the results calcd. from the Nernst theory based on his third law of thermodynamics. The degree of dissoc. of H can be represented within about 10% by the equation $\log [(1/\alpha^2) - 1] = (U/RT) - \log T + \log P - 2.95$, where $U = 95000$. All of the results agree with the consequences of the kinetic theory within the limit of error of the expts., in so far as the diffusion coeff. of H atoms is concerned, and with the results of sp. heat data for H detd. by the explosion method. E. B. MILLARD.

Correction for the error introduced by the container in determinations of the heat conductivity of liquids. J. VALLOT. *Compt. rend.* 161, 127–9(1915).—The usual procedure of measuring the cond. in the empty container, then of the same vessel filled with liquid, leads to inexact results, since the introduction of the liquid leads to a different reflection. Theory and practice show that if the liquid has the same n as the glass of the container, interior reflections are eliminated. For most liquids the reflections are very feeble, and the term R^2 in the usual formula should be replaced by one detd. by expt. This reflection was detd. by using very thin films of liquid between the plates of the app., which gave rise to little absorption but allowed the proper reflection, since this latter is not detd. by the thickness of the layer. The new formula was used to calc. heat conductivities for H_2O and 5 organic liquids. The new values are somewhat more regular than those calcd. from the older formula, and were in all cases 5 to 8% lower. E. B. MILLARD.

Some notes on the theory of the Rayleigh-Zeiss interferometer. LEASON H. ADAMS. *J. Wash. Acad. Sci.* 5, 265–76(1915).—In the course of some work in which a Zeiss interferometer was employed for detg. the concn. of certain solns. some trouble was experienced at first on account of the alteration of the achromatic reference fringe produced by differences in optical dispersion. It was necessary, therefore, to derive formulas from which the exact amt. of shift of the achromatic fringe could be predicted. The relationships involved are treated under two heads: (1) The optical path-differences resulting from the tilting of a plane parallel glass plate; and (2) the shift of the achromatic fringe in white light. L. H. ADAMS.

Physical photometer in theory and practice. W. W. COBLENTZ. *J. Franklin Inst.* 180, 335–48(1915).—Considerations of the transmission of light from a "4 watt" C lamp through a soln. contg. $CuCl_2$, K_2CrO_4, $CoSO_4(NH_4)_2SO_4$, and HNO_3 of specified concns. C. has described a photometer consisting of a thermopile, in front of which has been placed the above soln. for working out the "luminosity curve" and a water cell. E. B. MILLARD.

Rare earths. Absorption spectrum of neodymium. CH. GARNIER. *Arch. sci. phys. nat.* 40, 93–105(1915); cf. *C. A.* 8, 616.—Relatively pure $NdCl_3$, containing only small amts. of Pr and Sa, was converted into the nitrobenzenesulfonates. By the method of Holmberg (*C. A.* 1, 2351) these were fractionally crystd. about 100 crystns., yielding 15 fractions of which the first and the two last contained too small quantities of the earths for a comparative study of the absorption spectra. The remaining 12 fractions were transformed into chlorides and examined in 0.125N soln. with a layer thickness of 200 mm. Differences from one fraction to the next were not very marked and detailed results are given for the alternate fractions 2–12. A detailed comparison with the observations of other investigators is presented. The at. wts. of the various fractions were detd. by the titrimetric method of Kruss-Wild (*Z. anorg. Chem.* 38, 192(1904)). Most of the Nd was in fractions 4–6. At. wts., fract. 4, 144.6; fracts. 5 and 6, 144.4. The latter, as especially free from Pr, were used for detg. the hydrates of Nd; fraction 4, well freed from Sa, was used for a study of phosphorescence. Results of this work are to follow. A. R. MIDDLETON.

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A theory of absorption, fluorescence, and phosphorescence. E. C. C. BALY. Univ. Liverpool. *Astrophys. J.* 42, 4–71(1915); cf. *C. A.* 9, 1001.—In previous attempts to explain absorption bands in chem. compds. the infra-red region has been ignored. The attempts have been to relate mol. structure and absorption. There is a definite relation, not between primary structure and absorption, but between absorption and chem. reactivity. (1) The idea of atomic fields is applied to mols. showing that the condition is metastable. There must ensue a condensation of the force lines to form a mol. field, with a resulting escape of energy. (2) Chem. properties depend on the condition of the mol. field; if it is entirely closed the mol. will have no reactivity; if there is an uncompensated residuum the mol. will have a residual reactivity. (3 and 4) Closed fields can be reopened (*a*) by a 2nd mol. having a residual field, an equil. being established on which the chem. reactivity depends, (*b*) by light, which shifts the equil. toward an opened-up state, a new photodynamic equil. being established. The light does work on the mol. and is, therefore, selectively absorbed. (5) The opening-up process must take place by stages, since the force field is complex. (6) Each stage represents a definite vibration rate of the mol. system, by which the stages may be recognized. (7) Energy absorbed must be re-emitted. The frequency of emission usually lies in the infra-red, but may be anywhere. Fluorescence and phosphorescence, therefore, mean the emission in the visible region. (8) Exptl. proof is found in 3 sets of observations: (*a*) in the existence of intermediate stages in chem. reactions, which phases may be recognized by their absorption of light of longer wave length; (*b*) in the variation of absorption power with progressive dilu. of the soln.; (*c*) in the fact that the fluorescent emission of certain organic compds. in 1 solvent has the same frequency as the light absorbed by the same compd. in a 2nd solvent. (9) The frequencies of the centers of all the absorption, fluorescent and phosphorescent bands shown by a substance are multiples of the frequency of an absorption band in the short-wave region of the infra-red. (10) The structure of the absorption, fluorescent, and phosphorescent band groups is partly due to the combination of the central frequency with the frequencies of the short wave-length infra-red absorption bands. (11) The entire absorption, fluorescence, phosphorescence, in whatever region they lie, may be calcd. from the mol. frequencies. There are at least 2 basis consts. for every complex mol. (12) The multiples of the basis consts. give the absorption bands in the long-wave infra-red. Convergence frequencies of 2 or more series of basis consts. or multiples of such frequencies give the absorption bands in the short-wave infra-red region. Multiples of these frequencies give the bands in the visible and ultraviolet. (13) By combination of these convergence frequencies or their multiples with successive multiples of the basis consts. all the lines of any band group may be calcd. This has been done in the case of the ultraviolet band group of benzene and the values show exceedingly close agreement with those observed. (14) Where an absorption band shows subdivision into sub-groups, the heads of the sub-groups are due to the combination of the central frequency with those multiples of the basis constants which are sufficiently active to evidence themselves as absorption bands in the short-wave region of the infra-red. (15) The absorption bands in the infra-red and all the component lines of the ultraviolet absorption-band groups of a compd. of 2 radicals can be calcd. from the basis consts. of the 2 radicals. This is proved by the calcn. of the absorption lines of phenol from the basis constants of benzene and water, and the absorption lines of aniline from those of benzene and ammonia. F. A. HARVEY.

Fluorescence and resonance of sodium vapor. II. R. J. STRUTT. *Proc. Roy. Soc. London* (*A*) 91, 511–23(1915); cf. *C. A.* 9, 1269, 2184.—Na vapor has been excited by the 2nd line of the principle series, λ 3303, generated in a quartz Na vacuum arc, and focused on the vapor by a quartz system. The intensity of the line 3303 was

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nearly equal to that of the D-line. Vapor illuminated by this light emits the D-line in fluorescence, *i. e.*, the 2nd line of the series was able to generate the first. Stimulation by ultraviolet light in general does not cause emission of the D-line. If one member only of the ultraviolet doublet 3303 is stimulated, not only one, but both of the D-lines are emitted, in about equal intensity. This is an unexpected result in view of the work of Wood and Dunoyer (*C. A.* **8**, 2843), who found that stimulation by D_2 light was unable to excite D_1 light. Stimulation at 3303 was not found to give rise to any observable resonance radiation of the same wave length, nor to any observable emission of the subordinate series lines. E. B. MILLARD.

Normal and anomalous dispersion in the long wave spectrum, and a discussion of Debye's theory of molecular dipoles. H. RUBENS. *Verh. deut. physik. Ges.* **17**, 315–35; see also *Sitzb. Kgl. preuss. Akad. Wiss.* **1915**, 4.—Theoretical. E. B. M.

Thiele's "phase" in band spectra. H. S. UHLER. Yale Univ. *Astrophys. J.* **42**, 72–91(1915).—The 2 older methods for calcg. Thiele's phase, c, in the equation of wave length, $\lambda = f[(n + c)]^2$ have been shown to be too complex for solution. A new method is developed and illustrated. It is shown that c is not a constant and that various other hypotheses of Thiele are in error. F. A. HARVEY.

The infra-red arc spectrum of barium. H. M. MARSHALL. Univ. Mich. *Astrophys. J.* **42**, 195–202(1915); cf. *Ann. Physik.* **33**, 739(1910); *Astrophys. J.* **34**, 1(1911).—The Ba arc obtained by putting fused $BaCl_2$ in the positive carbon at low currents (15–25 amp.) is very unsatisfactory as a source in bolometric measurements. A steady source may be obtained by using currents of 70 amp. or over on 220 v. This arc at times becomes very noisy and brilliantly white and in this condition certain new lines appear. A linear thermopile was used to locate lines. With a slit width of 2 mm. the optical system used made the extent of the spectrum on the thermopile at one time about 3.5 to 6 Å. U. The region from 11,000 to 32,000 Å. U. was studied. Graphite rods were used to check the new lines found. K seemed to be the only impurity in the C. About 35 new lines were found, among them the line at λ 12,085, which was predicted by Saunders, as the first term for the first subordinate series of doublets. It is pointed out, however, that the line does not appear under the same conditions as the rest of the series. Other series relations are given. F. A. H.

Comparative study of the absorption spectra of some compounds of phosphorus, arsenic, antimony, and bismuth. C. R. CRYMBLE. *Proc. Chem. Soc.* **30**, 179(1914).—In accordance with the rule connecting valency and absorption (*C. A.* **6**, 2885) it has been found that solns. of compds. of the above metals absorb ultraviolet light to an extent which varies greatly with the nature of the compd. If the chlorides ECl_3 are compared, the limit of general absorption is displaced toward the visible range on passing from PCl_3 to $BiCl_3$, and in the latter compd. an absorption band makes its appearance in Bi/1000 solns. with a head at 2850. The compds. PCl_5 and $SbCl_5$ possess much greater absorptive power than the corresponding trichlorides. The limit of general absorption of $SbCl_3$ and the absorption band of $BiCl_3$ are displaced toward the visible on formation of the complex salts $ECl_3.nMCl$. Phosphates and arsenates, like selenates and sulfates, are quite diactinic; antimonates and arsenites show slight absorption. The grouping P:O in the P oxy-acids is devoid of absorptive power, and $POCl_3$ is almost diactinic. Further expts. on the 4th group elements, especially Sn and Pb, are in progress; from these it is hoped to gain information on the constitution of their salts. E. B. MILLARD.

Absorption spectra of certain aromatic nitroamines and nitroamides. II. G. T. MORGAN, H. W. MOSS AND J. W. PORTER. *J. Chem. Soc.* **107**, 1296–1318(1915); cf. *C. A.* **6**, 2917.—The usual exptl. method has been employed, using a Mo spark, a

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one-prism Hilger spectrometer, without the refinements suggested by Merton (*C. A.* **7**, 1447). Solns. of 52 organic nitro compds. in $M/5000$ concns. in abs. alc. have been studied in layers of 9 different thicknesses, and the oscillation frequencies plotted against log. of the equivalent thickness of $M/5000$ soln. The compds. include nitroaminophenols, stereoisomeric nitrotoluidines, nitroaminotoluenes, and -xylenes, 20 different dinitroamino-*o*-xylenes, derivs. of nitro-*p*-phenylenediamine, nitroaminophenols, etc. The rule that replacement of H by Me in an organic substance is not accompanied by any marked alteration in the character of the absorption spectrum beyond a shifting of the absorption toward the red was not generally true. It failed completely in successive methylation of 3:5-dinitro-*p*-toluidine, 3,5-dinitro-4-amino-*o*-xylene, and other compds. The conversion of *o*- or *p*-nitroaniline into dinitro compds. is not accompanied by marked changes in the absorption, but the introduction of a 3rd nitro group produced a considerable alteration. Acylation either obliterates the absorption band completely or greatly reduces its persistence and shifts it toward the blue, for both organic and inorg. compds. Residual affinity of the aminic N is a predominant factor in detg. the character of the absorption, for whenever this is modified by acylation, the same change in absorption is produced. Apart from this rule there is no apparent general relationship between the orientation of the amino group in regard to the other substituents of the nucleus and the character of the absorption spectrum. Differences between closely related substances are due to specific differences of chem. structure which "are far too subtle to be indicated by our ordinary conventional modes of representing chem. constitutions." E. B. MILLARD.

Extinction measurements of solutions of sulfurous acid, sulfites, hydrogen sulfites and metabisulfites, and of gaseous and liquid sulfur dioxide. C. S. GARRETT. *J. Chem. Soc.* **107**, 1324–34(1915).—Acid sulfites were made by half neutralization of concd. SO_2 in H_2O with Rb, K, Na and NH_4 hydroxides, and their absorption spectra photographed in a Hilger quartz spectrometer, using a Ni arc as the source of light. The mol. extinction was calcd. from the usual formula and its log. plotted against the wave length over the range 3400 to 2000 Å. for 0.06 *N* solns. of H_2SO_3 and each of the acid sulfites prepd. above. Freshly prepd. solns. of the acid sulfites showed almost no selective absorption, but the absorption changed on standing in the light, and reached a max. change after a few weeks. The change could not be due to the formation of metabisulfite according to the reaction $NaHSO_3 + NaHSO_3 = Na_2S_2O_5 + H_2O$, for these compds. reach the same max. on standing as the acid sulfites. From this fact it must be concluded that at this concn. (0.06 *N*) there is no difference between the 2 derivs. The normal sulfites exhibit no selective absorption at all, even on long standing in the light, and the mixed sulfites, produced by adding NaOH and then KOH, or in the reverse order, also show no selective absorption. The effect could not have been due to the ultimate replacement of the K by Na in one compd. on account of the difference in basicity, for a soln. of 0.1 *N* SO_2 neutralized with K and Ag hydroxides in the ratio 9:1 also showed no selective absorption. The seat of selective absorption is the dissolved or hydrated SO_2 which is in equil. with that which formed H_2SO_3 in the H_2O. If the amt. of $SO_2.xH_2O$ in aq. H_2SO_3 is 100, the amts. in the other salts are $RbHSO_3$ 24.8, $KHSO_3$ 20.2, $NaHSO_3$ 19.1, NH_4HSO_3 17.5. The center of absorption of liquid SO_2 lies between the max. absorption for the gas and the soln., namely at 2850. The gaseous max. was at 2961 and the aq. soln. at 2770 Å. Solns. contg. an organic radical, and the symmetrical and unsymmetrical Et_2SO_3 showed the beginning of selective absorption on long keeping. E. B. MILLARD.

The magnetic rotation of the plane of polarization in titanium tetrachloride. L. H. SIERTSEMA. *Verslag. Akad. Wetenschappen* **23**, 1259–64(1915).—CCl_4 is the only diamagnetic substance which shows negative magnetic rotation. The measure-

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ments presented in this communication were carried out for the purpose of finding out whether or not the dispersion formulas derived from the electron theory would be applicable to this substance. The magnetic rotation was detd. for a number of wave lengths in the visible spectrum. A half-shadow method was used and the sources of light were first a quartz-glass amalgam lamp and second an arc-lamp. The application of the dispersion formulas to these results will be treated in a forthcoming paper.
L. H. ADAMS.

The cathode ray tube and its application. M. E. TRESSLER. *Gen. Elec. Rev.* **18**, 816–20(1915).—The mechanical construction and theory of operation of several of the more successful cathode ray tubes is reviewed. Its use as an oscillograph and as a wattmeter for measuring very small amounts of power at low power-factors and high voltages is discussed. In order to use it for either of these purposes the rays are deflected by means of a transverse elec. or magnetic field applied a short distance below the diaphragm opening. The law of variation of dielec. loss in insulations with temp. and voltage has not been detd. If this loss were similar to resistance loss it might be expected to vary with the square of the voltage at constant temp. However, several factors, such as area, thickness, thermal cond., size of electrodes, time, etc., enter into the problem.
W. E. RUDER.

Selective and normal photoelectricity of potassium. G. WIEDMANN. *Verh. deut. physik. Ges.* **17**, 343–9(1915); cf. *C. A.* **8**, 1537.—It was shown exptly. that with successive decreases in the quantity of gas present, the photoelectric sensitiveness of K sinks to 1% of its original value. The selective action of K in its characteristic wave-length range disappears. Further expts. are in progress to det. the function of the specific gases in the photoelec. phenomena and whether the selective action is found in other wave lengths.
E. B. MILLARD.

Photoelectric effect of metals under the influence of the glow discharge. E. WERTHEIMER. *Verh. deut. physik. Ges.* **17**, 289–305(1915).—Expts. with Mg, Zn, Cd, Pb, Sn, Bi, Ni, Fe, and Cu showed that with each of these metals the photoelec. current was largely diminished when the atm. was changed from moist air to dry air or to dry or moist H. In contrast to this fact, expts. with Ag showed an increase in the photoelec. effect on passing from air to H. Under the influence of the glow discharge in H the following metals increased the effect: Zn, Cd, Pb, Sn, Bi, Ni, Cu, Ag, Pt, Pd. With Cd it was possible to obtain qual. reproducible increase and decrease curves showing 2 maxima. Evidence was obtained of the existence of a spectral variation of photoelec. sensitivity from the course of these curves. The expts. seemed to show that the photoelec. effect depends upon 2 independent variables, the purity of the metal surface and the presence of a water film on the surface.
E. B. MILLARD.

Thermionic currents. O. W. RICHARDSON, *et al. Electrician* **75**, 887–8(1915).—A discussion before the British Assoc. at Manchester. R. states that there are 2 different emissions of ions by pure metals in a vacuum and that these have no connection with each other. The one, the emission of + ions of atomic dimensions, was strongest on 1st heating, and was usually due to impurities such as Na and K atoms; the other, emission of electrons, continues indefinitely, as in the Coolidge tube. The origin of the emission in either case may be accounted for physically or chemically, yet in the case of W, as observed in the Coolidge method, the observations obtained definitely eliminate chem. action as an explanation of thermionic emission. R. found in his expts. that laws governing thermionic emission of electrons were quite similar to the laws of evapn. Further discussion is given by others both in favor of and against the "Richardson effect" and the chemical theory.
I. C. MATTHEWS.

New theories of magnetism. P. WEISS. *Electrician* **75**, 888–9(1915).—On examg. the alloys of Fe with Ni and Co it was found that there was no continuous

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variation on altering the proportion of the constituents, but that the curve consisted of discontinuous lines intersecting at points corresponding to definite compound mols., each characterized by a different magneton no. By plotting the reciprocal of the susceptibility against abs. temp., sudden changes in the "Curie constant" indicated a transition from one form of substance to another. The systems are quite complex in Fe, as in β-iron three stages are specified: β_1 12 magnetons, β_2 10 magnetons, β_3 20 magnetons. In the study of solns. certain remarkable exceptions to the magneton system were revealed. One of these was $FeSO_4$ where a mean of 26.51, indicating the half unit, was obtained. Ferrous ammonium sulfate also gave 26.49, and Cu 9.62 magnetons. With gases, however, the values were quite in agreement; O gave 14.014 and 7.007. Fields of the order of 25000 units were employed in these tests.

W. E. RUDER.

Magnetochemistry of the salts of copper and the magneton theory. I. Cupric chloride, nitrate, and sulfate in concentrated solutions. B. CABRERA AND E. MOLES. *Anales soc. españ. fis. quim.* **12**, 373–9(1914).—Detns. of the magnetic susceptibility of $CuCl_2$, $Cu(NO_3)_2$ and $CuSO_4$ yielded values which are in fair agreement with the law of Liebknecht and Wills. H. S. PAINE.

Electrical effects accompanying the decomposition of organic compounds. II. Ionization of the gases produced during fermentation. M. C. POTTER. *Proc. Roy. Soc. London* (*A*) **91**, 465–80(1915).—A metal plate with rolled edges was connected to an electrometer and suspended a few cm. above the surface of glucose undergoing fermentation, while the whole app. was screened in a box lined with Sn foil. The CO_2 liberated during the fermentation of glucose by yeast carries both positive and negative ions, and the suggestion is offered that the gases set free during putrefaction of org. matter are also ionized. Part of the ionization of the atm. may be attributed to the presence of such gases escaping from the soil and H_2O, and it was assumed that this ionization plays an important part in various electrical phenomena. E. B. M.

Electromagnetic inertia and atomic weight (NICHOLSON) 3. Dissociation of calcium carbonate below 500° (SOSMAN) 8. New group of photoelectric phenomena (GOLDSTEIN) 3.

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REBIÈRE, G.: **Introduction a la connaissance des solutions colloidales.** Bordeaux: Gounouilhou. 72 pp.

STARK, J.: **Principien der Atomdynamik.** Leipzig: S. Hirzel. 280 pp. $2.25.

3. RADIOACTIVITY.

WILLIAM H. ROSS.

Henry Gwyn Jeffreys Moseley. E. RUTHERFORD. *Nature* **96**, 33–4(1915).—Obituary. W. H. Ross.

Radiations from exploding atoms. E. RUTHERFORD. *Nature* **95**, 494–8(1915); *Rev. gén. sci.* **26**, 498–504(1915).—A discourse. W. H. Ross.

Hard X-rays. W. D. COOLIDGE. Gen. Elec. Co., Schenectady. *Am. J. Roentgenology* **2**, 723–5(1915); *J. Franklin Inst.* **180**, 492–3(1915).—X-Rays can now be produced having a penetration corresponding to the voltage indicated by a 20-inch spark between points which probably corresponds to something like 200,000 v. It is thought that the X-rays produced by this voltage will be found to have as high penetration as that of the hard γ-rays from Ra C. Rays of such great penetrating power should find important commercial application not only in medical therapeutics, but also in the diagnosis of faults in metals and in other materials. W. H. Ross.

The "green fluorescence" of X-ray tubes. HERBERT JACKSON. Univ. London. *Nature* **95**, 479–80(1915).—The only advantage of the green fluorescence of X-ray tubes appears to be that it provides the X-ray operator with a convenient rough indication of the hardness of the tube. The quality of the X-rays is in no way influenced by the nature of the fluorescence of the glass, and exptl. evidence has shown that a strong green fluorescence can only be obtained at some sacrifice of the excellence of the glass. In some cases in order to obtain the full green fluorescence an appreciable quantity of Fe must be added to relatively pure ingredients so that the necessary quantity of Mn may be incorporated in the glass, the Fe being needed to correct the amethyst color which so much Mn would otherwise impart to the glass. This procedure appears to impair the working qualities of the glass to some extent, and it is found that glass of a quality superior to that usually employed can be made if Fe and Mn are avoided. The evidence available indicates, moreover, that something akin to cryst. structure is obtained in a glass more readily when Mn is present, and although this tendency to crystn. does not interfere with the use of the glass under ordinary working conditions, no advantage follows from fostering this tendency. W. H. Ross.

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Interference of Röntgen rays and crystal structure. R. GLOCKER. Univ. München. *Ann. Physik* **47**, 377–428(1915).—The interference patterns produced by a crystal of rock-salt in the path of a beam of X-rays were compared with the patterns from a second crystal in the path of a very narrow beam of the rays reflected from the first crystal. The patterns show that although the primary beam contains a continuous range of wave-lengths, the secondary beam is monochromatic. In it there is little difference of intensity between the basic frequency and its first overtone, but the higher multiples are very weak. This is attributed to the distribution of frequencies in the primary ray. The lattice of rock-salt is face-centered; of sylvine, simple cubic; of KBr and of fluorspar, face-centered. The comparative spacings of the lattices of these crystals are, resp., as 1.000, 1.122, 1.150 and 0.878. G. L. WENDT.

The occurrence of radioactive waters in Norway. E. POULSSON. Univ. Kristiania. *Videnskaps. Math. nat.*; Sep. No. 8, 12 pp.; through *Chem. Zentr.* **1914**, II, 1469.—Following a review of the results obtained in an exam. of radioactive waters in Denmark, Sweden and Iceland, an account is given of an investigation of the radioactivity of the waters from 100 different sources in Norway. Almost all the waters proved to be radioactive, but in most cases the activity was very slight. The most active waters were obtained from springs at Näsodden, Sandsvär, at Jellum near Modum and on the Tandberg estate in Simoa valley. The values obtained for the activity of these springs amounted, resp., to 43.75, 31.6, 76.1 and 164.5 Mache units.

W. H. Ross.

The relation between the alpha-ray activities and ranges of radium and its short-lived products. HERBERT N. MCCOY AND EDWIN D. LEMAN. Univ. Chicago. *Physic. Rev.* [2] **6**, 184–91(1915).—It has been shown that for the Th and Act series the α-ray activity for each substance present, as measured by the ionization current, is proportional to the 2/3 power of its range (cf. *C. A.* **7**, 2012; **9**, 555.) Further proof of the rule is that the ratio of the activities of Ra Em + Ra A + Ra C to that of Ra itself as calcd. on this basis is 4.09 and the ratio measured is 4.11. The Ra was prepared free from decomp. products by bubbling air through 10 cc. of a dil. soln., heated almost to boiling, for 30 min. to remove Ra Em and to allow Ra A to disintegrate completely. $Pb(C_2H_3O_2)_2$ was added and pptd. with Ra B, Ra C, Ra D, Ra E and Ra F by H_2S. The treatment was twice repeated. The addition of $BaCl_2$ and H_2SO_4 then pptd. the Ra, which was spread over a brass plate in alc. suspension and dried. The final measurements, made after the disintegration products had accumulated for 6 months, were corrected for β-ray activity, escaped Em, and loss by recoil.

G. L. WENDT.

An investigation of the photographic effect of recoil atoms. A. B. WOOD AND A. I. STEVEN. Univ. Liverpool. *Proc. Phys. Soc. London* **27**, 189–92(1915).—The ionizing, phosphorescent and photographic effects of the α-particles from a radioactive substance entirely cease when the particle still retains about 40% of its kinetic energy. It appears possible, therefore, that the recoil atoms from a radioactive source should be able to effect a photographic plate, for, though the range of a recoil atom is only about $^1/_{100}$ of that of the α-particle shot off from it, the ionizing effect has been shown by Wertenstein and one of the authors to be 10 times as powerful over the corresponding range as that of the α-particle. Attempts have, therefore, been made to demonstrate this action in the case of the recoil atoms of Po, this substance being chosen on account of the inactive nature of the recoiling atom. Two distinct methods were employed: (1) the recoil atom was "absorbed;" (2) the difference of deflection of the α-particle and the recoil atom in a strong magnetic field was utilized in order to attempt to sep. their effects. Schumann plates were used as being most easily penetrable, but in all cases the results were negative or inconclusive. This is probably due to the fact that

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the recoil atoms are not able to penetrate sufficiently deeply into the sensitive layer to render the grains developable. PAUL D. FOOTE.

The Geiger apparatus for the photographic registration of alpha and beta particles. J. E. SHRADER. Williams Coll. *Physic. Rev.* [2] 6, 292–302(1915).—A study was made of the so-called "natural disturbances" which sometimes interfere in the electrical method devised by Rutherford and Geiger (*C. A.* 2, 2644) and improved by Geiger (*C. A.* 7, 3919) for counting the α-particles given off by radioactive substances. It was found that by the use of a Pt point, which can be heated without destroying the point, the natural disturbances can all be driven out so that without any difficulty a point can be secured which will give only the discharge caused by an entering ray. If protected from moist fresh air natural disturbances show no tendency to develop during the use of the app. The seat of these disturbances is in the point, and their number is not affected by the size of the ionization chamber. With a thoroughly heated Pt point, air, H, O and CO_2, if thoroughly dried, can be used equally well in the cylinder. No more difficulty was experienced in using the point at positive potential than at negative potential. With an ebonite end in the ionization chamber quite uniform deflections were obtained for entering rays. As a result, the number of particles registered is const. for all potentials of the point for discharges which give measurable deflections. The app. has been used to det. the rate of decay of Th B and the agreement with the accepted value is good. With the use of a Pt point the app. is considered to be adaptable to many kinds of radioactive measurements. W. H. ROSS.

Electromagnetic inertia and atomic weight. J. W. NICHOLSON. Univ. London. *Proc. Phys. Soc. London* 27, 217–29(1915); discussion 229.—A mathematical deduction is given of a simple formula for the combined mass of 2 elec. charges when in proximity to each other. This mass is not the sum of their individual masses when far apart, if it be supposed that all mass of positive electricity, like that of electrons, is of electromagnetic origin. Applications are made of the formula to questions of at. constitution and of radioactivity. A discussion is given of the evidence leading to the conclusion that the nuclei or cores of positive electricity in atoms are complex structures of electrons and even smaller positive nuclei. On this basis, emission of an α-particle by an atom does not decrease its at. mass by 4, a correction being necessary for the "mutual mass" of the α-particle and the rest of the core. Estimates are given of the magnitude of this correction, in the case of Ra and Th passing into Pb by the emission of particles. From the value given by Soddy (*C. A.* 8, 3753) for the at. wt. of thorite Pb, the av. distance apart of the components in a Ra nucleus is deduced to be of the same order as the radius of an electron. Suggestions of further interesting applications of the precise formula for mutual mass are also contained in the paper. PAUL D. FOOTE.

New group of photoelectric phenomena. E. GOLDSTEIN. *Verh. deut. physik. Ges.* 17, 256–8(1915).—Cathode rays have been generated by the discharge of Leyden jars sparked by an inductor; these differ from the ordinary cathode rays in several respects. They can show the characteristic color of the positive light over a part or all of the light column in gases in which the positive and negative lights have different colors. The identification as cathode rays was obtained from the behavior toward a magnet. If the rays are only partly colored, the color approaches closer to the cathode with increasing discharge intensity. Radiations from a plane cathode became more and more convergent with decreased d. of the gas in which the discharge took place. E. B. MILLARD.

Interference phenomena to be expected when Röntgen rays pass through a diatomic gas. P. EHRENFEST. *Verslag Akad. Wetenschappen Amsterdam* 23, 1132–8 (1915).—It has already been shown by W. Friedrich that a pencil of X-rays when passed through certain amorphous solids produces interference rings on a photographic plate.

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E. has now attacked mathematically the more simple problem of the passage of X-rays through a diatomic gas, and finds that in this case also interference rings should be formed. With increasing angle ϕ the intensity should vary periodically according to the relation, $1 + (\sin 2\pi\rho)/2\pi\rho$, where $\rho = 2a/\lambda \sin \phi/2$, λ being the wave-length of the X-rays and a the distance apart of the 2 atoms in the mol. The exptl. realization of these rings would be very difficult but E. thinks that by choosing the most favorable conditions it might be accomplished. L. H. ADAMS.

A new phenomenon accompanying the diffraction of X-rays in birefracting crystals. F. M. JAEGER. Groningen. *Verslag Akad. Wetenschappen Amsterdam* **23**, 1207–20 (1915).—After a brief review of the subject of the relation between symmetry of crystals and their X-ray patterns, J. gives an account of a series of expts. on typical crystals. The results lead to the conclusion that all previous theoretical views are incapable of adequately explaining the phenomena. L. H. ADAMS.

Collection of radium emanation and its preparation for therapeutic use (BOSWORTH) 11H. Work of the Physikalisch-Technishe Reichsanstalt in 1913 2.

BRAGG, W. H. AND BRAGG, W. L.: **X-Rays and Crystal Structure.** New York: Macmillan Co. 228 pp. $2.25.

SAPHORES, J. AND BOURION, F.: **The Numerical Data of Radioactivity.** Chicago: Univ. of Chicago Press. 9 pp. 2 fr. 50.

U. S., 1,157,925, Oct. 26. W. D. COOLIDGE. **X-Ray targets** are formed of a disk or plate, 1, of W embedded by a stem, 3, in a holder, 2, formed of Cu or Ag. Because of the somewhat retarded conduction of heat through the stem 3 the W will operate at a rather high temp. at which it has a considerable degree of pliability. Cf. *C. A.* **9**, 3027.

Brit., 11,427, May 8, 1914. T. T. BAKER. **A soluble radioactive salt** for use in baths is produced by adding radioactive matter to the salt when this is molten. Thus, NaCl + $BaCl_2$ is added to a molten bath salt, preferably containing a small % of $CaSO_4$.

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4. ELECTROCHEMISTRY.

COLIN G. FINK.

The development of the electrolytic copper refining industry in the United States. W. FRANCKE. *Metall u. Erz* **12**, 260–74(1915). CARLE R. HAYWARD.

The commercial aspect of electric zinc-lead smelting. W. McA. JOHNSON. *Trans. Can. Min. Inst.* **17**, 107–29(1914).—Ores crushed to proper size and roasted to remove most of the S are blended to give Zn 15–40, Pb 5–30, Cu 1–5, Fe 10–20, S 3–7, SiO_2 10–30, Al_2O_3 3–5, CaO 3–7%, mixed with 15% of soft coal and deoxidized in a muffler of the Hassenclever type at a final temp. of 850–1040°. Then the charge is fed continuously into the furnace. The Johnson continuous elec. zinc furnace at Hartford, Conn., cubical, and lined with magnesite brick, has a water-cooled tap-hole at the bottom for removing mat and Pb-bullion and another higher for removing molten slag; it has 4 C electrodes submerged in the slag and the charge. A brick-lined flue near the top carries vaporized Zn and gases to the condenser, elongated Fe vessels lined with fire-brick and capable of being heated or cooled. Zn combines first with reduced Cu, then with reduced Fe to form Cu mat which settles with some Ag

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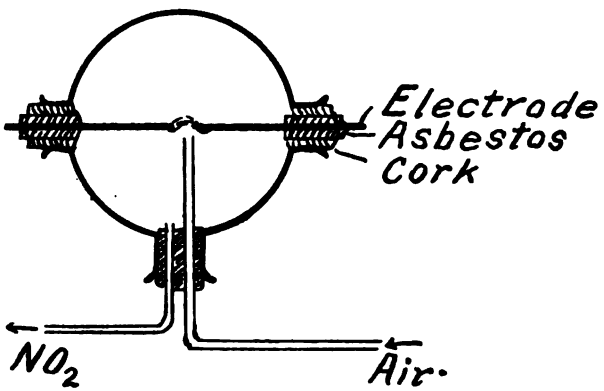
and Au. Reduced Pb settles with rest of Ag and Au. SiO_2, CaO, Fe_2O_3, etc., float as slag. Reduced Zn is vaporized and is collected molten in the condenser. The slag is deoxidized and desulfurized and the mat is so metallic that no S is evolved at the temp. of the fusion zone. Thus the gas is so pure that Zn changes directly to molten condition with little blue powder. For complex Zn ores the process is cheaper than the retort process and the Cu mat and base-bullion are cast directly in marketable form. Ore conc. can be shortened and crypto-cryst. Pb-Cu-Zn ores smelted. Costs and sample runs are given. R. B. DOLE.

Preparation of nitric acid from atmospheric nitrogen by means of the electric arc. F. KEUTEL. *Z. physik. Chem. Unterr.* **28**, 261–2(1915).—The app. (see. fig.) is for lecture purposes. In the opposite necks of a 3-neck glass globe are the adjustable brass rod electrodes, about 5 mm. diam. In the other neck is a tube for supplying air at the rate of about 1–5 bubbles per sec., the upper end of this tube being about 0.5 cm. below the arc. A 2nd tube carries away the mixt. of air and NO_2. A current of 2 amps. gives an arc about 1 cm. long.



Cf. *C. A.* **2**, 573, 1388; **3**, 748, 1619, 2088, 2777; **4**, 1713; **5**, 1369, 2034, 3527; **6**, 2498; **7**, 937, 2159; **8**, 3396; **9**, 1273, 1274, 2737. J. H. MOORE.

Single potentials in the silver cyanide plating bath, as affected by its composition and concentration. F. C. FRARY AND R. E. PORTER. Univ. Minn. *Trans. Am. Electrochem. Soc.* **28** (advance copy) (1915).—Even when the object to be plated is properly cleaned, a non-adherent deposit may be obtained if the plating bath dissolves any of the metal of which the object is composed. A very thin coat may be given in a dipping bath, where the time of immersion is short, even if the surface is attacked by the bath, but thicker coats, deposited electrochemically, will not adhere if the bath attacks the object. A dipping may precede the electrodeposition of a thick deposit, if the latter is to be formed from a bath which attacks the object. If a metal dissolves in $KAg(CN)_2$ soln. it is less noble (more negative) than Ag. The potentials were measured by the potentiometer method. A normal calomel electrode was used, with concd. KCl soln. as intermediate liquid. The single potentials of Hg, Ag, Cu, brass, and Fe in solns. of $KAg(CN)_2$ with various proportions of excess KCN, with and without KCl and KOH equiv. to the Ag, were detd. and the results are given in tables and curves. The conds. of the solns. were also detd. Fe and Hg were + to Ag when 10% free cyanide was present, but — in absence of cyanide. KCl and KOH render Fe 0.1 v. less +. Cu and brass were slightly — and were not affected by KCl or KOH. Zn was —. The titration of KCN by $AgNO_3$ according to Liebig, gave results which were low to the extent of 3% of the cyanide present. Titration with $HgCl_2$ gave better results. SHERMAN EASTMAN.

The electrolysis of copper sulfate liquors, using carbon anodes. LAWRENCE ADDICKS. *Trans. Am. Electrochem. Soc.* (advance copy) **28**, 29 pp.(1915); *Met. Chem. Eng.* **13**, 748–55(1915).—The use of SO_2 directly in the leaching cell, as a depolarizer, according to the equation $CuSO_4 + SO_2 + 2H_2O$ + current = $Cu + 2H_2SO_4$ is not desirable.

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The process developed, uses $FeSO_4$ as a depolarizer and $Al_2(SO_4)_3$ as a substitute for a diaphragm, to restrain the redissolving of the cathode Cu. The $Fe_2(SO_4)_3$ formed was reduced by SO_2 outside the cell room. The effect of circulation and agitation on the v. was studied at various temps. and c. ds. C anodes will stand up in sulfate liquors if properly depolarized. Sulfates other than Cu, present as impurities do not foul the cathodes. 2.25 lbs. (1.019 kg.) of Cu per kw.-hr. can be recovered under proper operating conditions. Three, or possibly 3.25, units of acid are made per unit of Cu, of which 1.5 to 1.75 units are new acid from the tower gases, obtained by the roasting.

SHERMAN EASTMAN.

Structure of electrolytically deposited copper. A. SIEVERTS AND W. WEPPELMAN. *Z. anorg. Chem.* **91**, 1–45(1915).—The authors investigated the structure of electrolytically deposited Cu from $CuSO_4$ soln. acidified with H_2SO_4 with and without the addition of colloids, from neutral $CuSO_4$ soln. and from alk. solns. The Cu deposited from colloid-free $CuSO_4$ soln. (250 g. $CuSO_4 + 5H_2O$ + 7 g. H_2SO_4 per l.) has a cryst. structure. At the start of the electrolysis a fine, cryst., but poorly adhering layer seps. on the cathode; later V-shaped crystals appear, almost vertical to the surface of the cathode. The size of the crystals decreases with the increase in the c. d. At high c. ds. (about 0.4 amp. per sq. cm.) the structure is not well defined and the deposit shows splits and holes. Stirring (530–550 r. p. m.), heating of the electrolyte to 40–50°, increase in the $CuSO_4$ concn. (350 g. per l.), addition of more H_2SO_4 or the addition of glycerol 100 g. per l. of electrolyte and addition of Na_2SO_4 or $Al_2(SO_4)_3$ are good factors for obtaining regular cryst. structures even at higher c. ds. In neutral $CuSO_4$ soln. (5 g. per l.) at 0.01–0.06 amp. cm^2. a brittle deposit of small Cu crystals mixed with Cu_2O is obtained. Small additions of colloids to the electrolyte make the deposits brittle without changing the cryst. structure. Addition of 1 g. gum arabic to the electrolyte diminishes the size of the Cu crystals; after adding 5 g. of this gum the structure cannot be defined. The addition of 0.02–0.07 g. per l. of gelatin (or albumin) gives a deposit which has a strata formation. Cu deposits from alk. soln. of complex Cu salt (30 g. $CuSO_4$ + 48 g. NaOH + 150 $C_4H_4O_6KNa$ + 4 H_2O) at 0.003 amp. per cm^2. adhere very strongly to the cathode (Fe, Ni or Zn but show no regular structure. The app. used in all the expts. was: A glass jar 20 cm. diam. by 10 cm. high to contain the electrolyte; a Cu disk enclosed in parchment paper was used as anode and in the center of the jar the Witt stirrer was fastened. 4 square Fe (2 × 2) rods 7 cm. long were used as cathodes. The temp. of the electrolyte was about 25° using 110 d. c. current. The vol. of the electrolyte was 2 l. Time of expt. from 2 hrs. to few days. About 49 photomicrographs are shown.

Z. SMILOVICI.

Contact electrification and the electric current. F. SANFORD. Stanford Univ. *Sci. Monthly* (sequel to *Pop. Sci. Monthly*) **1**, 124–31(1915).—S. reviews the early work of Galvani, Volta, *et al.* and leads up to his present conclusion that cohesion or affinity is an elec. attraction between the atoms or mols. of a body. The only known methods of changing the elec. attraction between 2 bodies whose distances and directions from other bodies remain constant, is by varying the magnitude of their charges or by changing the sp. inductive capacity of the medium between them. The actual sequence of the phenomena is a redistribution of the charges of the surface atoms of the metals, a consequent change in surface cohesion and a resultant oxidation of one of the metals.

C. G. F.

A galvanic cell which reverses its polarity when illuminated. ALAN A. C. SWINTON. *Proc. Phys. Soc. London* **27**, 186–8(1915).—When two plates, one of C or Cu, and the other of tinned Cu coated on one surface with Se and varnished with enamel over the remainder of its surface, are immersed in tap water, the Se plate is positive to the C or Cu in the dark and negative the moment it is illuminated.

P. D. F.

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The development of the arc lamp industry. J. SCHMIDT. *Elek. Anzeiger* **1915**, 294–9.—A review with comments and numerous references. C. G. F.

Arcing characteristics of air break switches. C. E. BENNETT. *Elec. World* **66**, 853–5(1915).—B. describes and illustrates arrangements of test circuits, character of tests operating conclusions, and interpretation of oscillograph records in connection with high tension operation. Of the 3 switches on which the largest number of tests were made, one was rated at 70,000 v. and the other two at 44,000 v. When the air is perfectly still the heat of the arc will carry it up the horns. But with the slightest wind blowing, the arcs are blown sidewise. C. G. F.

Filament temperature. M. PIRANI AND A. R. MEYER. *Elek. u. Masch.* (Vienna), Aug. 15, 1915; through *Elec. World* **66**, 876(1915).—The first part of a theoretical and experimental investigation of the filament temp. of elec. incandescent lamps. Some of the results are as follows:

	W.p.c. hr.	W.p.c. (spher.).	True temp. (C°.).
Carbon	10.0	11.10	1615
	3.0	3.35	1900
	0.6	0.67	2440
Tantalum	10.0	12.20	1470
	2.0	2.45	1845
	0.5	0.61	2335
Tungsten	10.0	12.20	1475
	1.0	1.20	2080
	0.5	0.61	2355

The figures of true temp. are those found by the authors. The figures for the W lamps refer to W filaments *in vacuo*. The authors have also made a detn. of the temp. of the filament for N-filled W lamps. C. G. F.

Carbon as a heating element in appliances. C. W. PIPER. *Elec. World* **66**, 134(1915).—In order to det. the most practical form of C to use as a heating element, P. tested C rods $1^1/_8$ in. in diam. of high and low resistance and of a stack of 21 C disks $1^1/_2$ in. in diam. and $^1/_8$ in. thick. The resistance of a $^3/_8$ in. rod before being heated was 1890 ohms. After 290 milliamp. had been passed through the rod for 30 min. the resistance dropped to 660 ohms hot. Interrupting the current for 3 min. the resistance increased to 1320 ohms. Passing 350 milliamp. for 30 min. the resistance drops to 740 ohms, and the C turns a dull red heat. At 400 milliamp. the heat radiated is sufficient for practical purposes but the carbon oxidizes at the surface. P. concludes from his expts. that rods are satisfactory for heating units where a high temp. is not desired. For variable resistance, C disks are more satisfactory, for the resistance of a stack of disks can be controlled by varying the pressure. 30–40 amp. per sq. in. proved to be a suitable working d.; the disks would prove satisfactory for use in elec. soldering irons, flatirons, etc., where a variable high temp. is desired. Z. SMILOVICI.

Relation between the alternating current conductivity of a dielectric and its change of capacity with frequency. G. E. BAIRSTO. *Electrician* **76**, 53–5(1915).—The % change of capacity, $\Delta C/C$ 100, of a dielectric for a given range of frequency is a definite function of the a. c. cond. In nearly all cases $\Delta C/C$ is proportional to b, where b multiplied by the frequency represents the main part of the a. c. cond. $\Delta C/bC$ is a constant which is independent of the temp. of the dielectric and its state of moisture content. C. G. F.

Preventing smoke electrically. H. C. WOLF. *Elec. World* **66**, 692(1915).—In order to show the relative amts. of pptn. at various points after the gases entered the flue, strips of white paper were attached to the inner surface of the stack, extending throughout its full length. The hydrocarbons from freshly burned coal and oils gave

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a brown deposit on this paper, shading from a very dark brown at the point of entrance of the gases to a clear white at the point of leaving. The shading from the one extreme to the other seems to follow somewhat a hyperbolic law. When a gas becomes too moist (that is, approaches steam) there is great difficulty in maintaining a stable medium and dependable results are not obtainable. For this reason the agglomeration of water particles in steam by this process has proved very unsatisfactory. C. G. F.

DUTOIT, P., LEWIS, W. C. MCC. AND MAHLKE, A.: **The Numerical Data of Electricity, Magnetism and Electrochemistry.** Chicago: Univ. of Chicago Press. 79 pp. 10 fr.

U. S., 1,154,701, Sept. 28. E. A. KRÜGER. **Tungsten filaments** are formed by pressing powdered W mixed with small amts. of C and H_3BO_3 into a rod, heating to 1000–1200° to cause the particles to cake together and then electrically heating the rod to incandescence in a stream of H and reducing the rod to the size desired mechanically. The filament may then be purified by further heating *in vacuo* to 2000–2200° and hammering, rolling or drawing.

U. S., 1,154,800, Sept. 28. S. PEACOCK. **Fixing atmospheric nitrogen in the form of nitrides.** A mixt. of feldspar or SiO_2 and CaO with sufficient C to form SiC_2 from the SiO_2 is heated in N (or producer gas or other gas high in N) to about 1600–2000° to form first a higher carbide of Si and then to form double nitrides of Si and K, Ca and Al (if feldspar is used). Zn carbide may also be used in the charge and facilitates the fixation of N.

U. S., 1,154,801, Sept. 28. S. PEACOCK. **A volatile aluminium "carbonitride"** is produced by heating a mixt. of Al_2O_3 and C in an atm. of N or producer gas containing a large % of N to a temp. of about 1550° while maintaining the partial pressure of the CO produced below 400 mm. Hg and collecting the volatilized product. It is a white powder, volatilizing at about 1550° and after hydrolysis forms a white ppt. with Ag and Pb salts and produces NH_3 by reaction with steam at 200°.

U. S., 1,155,046–7, Sept. 28. W. A. CROWDUS. **Storage batteries** (structural features).

U. S., 1,155,426, Oct. 5. A. J. LIEBMANN and W. A. MEGRATH. **Tungsten electrical contacts** are made by electrically welding a W plate to a backing of Fe, steel, or other metal, using W powder and KNO_2 between the metals to effect the weld.

U. S., 1,155,427, Oct. 5. A. J. LIEBMANN and W. A. MEGRATH. **Electric make-and-break contacts** are formed of a face plate of W and a backing of Fe or steel, welded together as in the preceding patent.

U. S., 1,155,512, Oct. 5. A. L. SALTZMAN. **Primary battery** (structural features).

U. S., 1,155,649, Oct. 5. N. FALLEK. **A composition for filling electrical rectifiers** (*e. g.*, between Al and Pb elements) is formed of 15 parts of a 6% Na phosphate soln. absorbed in asbestos and mixed with 1 part of Na silicate soln. of 1.18 sp. gr.

U. S., 1,156,163, Oct. 12. F. M. LOCKE. **An insulator for high voltage line conductors** is formed of a glass base fused into a homogeneous mixt. with H_3BO_3 or other B compd. which increases the resistance of the insulator to high voltages about 20%. Cf. *C. A.* 9, 269.

U. S., 1,156,492, Oct. 12. H. C. G. REMANÉ. **Drawing tungsten wire.** The wire is coated with unctuous W sulfide which serves as a lubricant during the drawing, and after drawing the sulfide is decomposed by heating in H. The colloidal W compds. ($H_6W_2C_9O_3$?) prepared from NH_4 tungstate and pyrogallol may also be used.

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U. S., 1,156,686, Oct. 12. G. M. HOWARD. **Negative pole plates for storage batteries** are made with active material of metallic Pb with sufficient $PbSO_4$ to serve as a binder for the Pb during shipping and storage, and substantially free from oxide so that it will not heat when immersed in electrolyte.

U. S., 1,156,696, Oct. 12. C. R. KRUEGER. **An arc-lamp electrode** giving a white flaming or luminous arc is formed of Ti carbide 96%, LiF or other Li salt (which acts as a "steadier") 1% and CuO 3%, enclosed in a thin Fe tube.

U. S., 1,156,826, Oct. 12. J. N. TUTTLE. **An electrolytic meter** is formed with Hg anode and cathode, an electrolyte and a silk diaphragm sepg. the Hg anode and cathode from the electrolyte.

U. S., 1,157,271, Oct. 19. G. WEINTRAUB. **Boron nitride** stable to hot H_2O and O is produced by heating ordinary unstable B nitride to about 2000° in an atm. of vaporized H_3BO_3 or B_2O_3 until fumes are no longer evolved.

U. S., 1,157,280, Oct. 19. W. G. ABBOTT, JR. **Drawn arc-light electrodes** are formed of a sheath of mild steel containing a filling of magnetite or Ti carbide mixt.

U. S., 1,157,288, Oct. 19. F. BLAU. **Very fine uniform tungsten wire** is formed of W which has been rendered non-cryst. by mechanically working while hot, by shaping into wire and then subjecting the partly finished wire to electrolytic corrosion by making it the anode in a soln. of HNO_3, $K_4FeC_6N_6$ or an alkali persulfate.

U. S., 1,157,531, Oct. 19. F. D. HARPER. **Dry-batteries for flash-lights, etc.** (structural features).

U. S., 1,157,830, Oct. 26. R. L. WHITEHEAD. **Electrolytic refining of tin** is effected by using impure Sn as anode and passing current from it to a cathode through a soln. of hydrofluosilicic acid containing sufficient H_2SO_4 to combine with any Pb which is present and ppt. it.

U. S., 1,157,859, Oct. 26. W. O. FREET. **Electric ozone generator.**

U. S., 1,157,919, Oct. 26. W. C. ARSEM. **Dry particles of hydrated silicic acid** are used as filler or packing around the conductor in elec. cut-out fuses.

U. S., 1,158,171, Oct. 26. J. W. BROWN. **Baked carbon electrodes** or other articles of baked C are rendered compact and seams and laminations are removed from them by impregnating with tar or oil, passing an elec. current through the material until the C becomes plastic and then subjecting it to pressure.

U. S., 1,158,253, Oct. 26. F. W. MCNEAR and P. E. BOWLES, JR. **Oil and water emulsions** are broken up by passing an a. c. through the emulsion, of sufficient potential to form a chain of H_2O globules across the emulsion which short circuits the electrodes, generates steam, prevents passage of current at this point and causes increased passage of current at other points through the emulsion and successive chains are thus formed and broken.

Brit., 11,107, May 5, 1914. A. V. LIPINSKI. **Hydrocyanic acid** is obtained from N and oil or natural gas which may be carburetted with paraffin hydrocarbons such as benzine, by passing the gas mixt. through an expanded high-potential arc, and the reaction products, freed from HCN, are returned to the reaction chamber just beyond the arc so as to cool the gases and avoid the formation of soot from unused carbonaceous gas. The gases are replenished in N by withdrawing a part from the circulation, burning it with air in a sep. combustion chamber, and returning it to the furnace. In a suitable arrangement, the central water-cooled electrode is surrounded by a cylindrical electrode opening into a water-cooled chamber and surrounded by an electromagnet. The arc is formed between the electrodes, and the gases, after passing through the arc, are cooled by reaction products freed from HCN admitted through the central electrode and escaping by a suitable passage.

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Brit., 13,549, June 3, 1914. Gen. Elec. Co. **Purifying tungsten wire which** has been coated with an adherent carbonaceous lubricant, between or after the various drawing operations, by heating it moderately in air or an appropriate reagent and subsequently heating it strongly in an inert or reducing atm. such as H and N. The wire becomes pliable, and does not need crimping to keep it straight; it is applicable for use as filaments and supports in elec. lamps, and may then be made from materials treated with rare-earth compds. to prevent "offsetting."

Brit., 14,119, June 11, 1914. A. Dinin. **Electrodes** of Pb accumulators. Charged negative electrodes are completely dried, away from the air, and can then be kept or transported in air without loss of charge; before use, they require only to be put in the ordinary electrolyte. Drying may take place in vacuum chambers, warmed to 30–40°, or after immersion of the electrodes in a volatile liquid such as alc.

Brit., 14,192, June 12, 1914. E. F. Cote and P. R. Pierron. **Extracting crude zinc** by distn. in an electrode furnace, condensing it in an adjacent furnace in the form of drops and powder, with sepn. of the accompanying gases, and thereupon refining it, with little intermediate cooling. Impure ores may be used, including those containing fluorspar. Unroasted blendes are mixed with Fe, either strip, granulated, or cast, or with CaO and C. Calamines are calcined and mixed with C and fluxes, and roasted blendes are treated similarly.

Brit., 14,374, June 15, 1914. H. A. Wagner. In the **electrolysis of ores,** the sulfide or other ores of Cu, Zn, or other metals are maintained in suspension in the anode compartment of a cell having in the path of the current a depolarizing material containing an oxidizing agent and optionally Hg and a H absorbent. The depolarizer is placed between two plates of porous material, such as earthenware or asbestos, to form a diaphragm, and may be made by mixing pumice, charcoal, and MnO_2, treating with a soln. of $HgCl_2$ and $PdCl_4$, drying, and heating to 100–150° in a gaseous agent, such as HCHO, reducing the chlorides but not MnO_2. Brine is a suitable electrolyte. A shoot conveys the ore, preferably finely powdered, into the anode compartment, where it is maintained in suspension by a propeller or by an air blast; a steam coil may be arranged in the same compartment. Residues are removed through a manhole. The anode may be of graphitized C, and the cathode of the metal to be deposited.

Brit., 14,381, June 15, 1914. C. Trenzen. **Tungsten powder,** in the usual crystalline form obtained by the reduction of the trioxide, is stirred into a soln. of an alkali nitrite and heated therein at 127° for 3 or 4 hrs., after which it is thoroughly washed and dried. The dry powder may be compressed into a bar which may be consolidated by highly heating *in vacuo* or in an inert gas. The product is stated to be ductile.

Brit., 14,448, June 16, 1914. Chem. Fabrik Griesheim-Elektron. App. or appliances for use in the manuf., storage, distribution, employment, etc., of **ozone,** are constructed of, or lined with, Fe-Cr alloys containing at least 25% of Cr; preferably the alloys are free from, or poor in, C. The application of such alloys in the elec. production of ozone from air, and in the use of ozone for disinfecting, water-purifying, and ventilation, is indicated. The alloys are obtained by the alumino-thermic process or by fusion of the constituents; the absorption of C during the fusion should be avoided, *e. g.*, by carrying out the process on an acid or basic bed, or in crucibles with an acid or basic lining. The above-mentioned alloys also resist the action of the N oxides produced in the elec. manuf. of ozone.

Brit., 14,513, June 17, 1914. A. E. Battle. App. for **cleaning metals by electrolysis.**

Brit., 14,514, June 17, 1914. A. E. Battle. **Electrolytes for the deposition of tin,** its extn. from ores, or its removal from surfaces of other metals, contain H_3PO_4. $SnSO_4$

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or $SnCl_2$ may be dissolved first in H_2O or directly in weak or strong H_3PO_4; if strong acid is used, the soln. may be used either with or without previous dilu. with H_2O or glycerol. Pptn. is prevented by using excess of H_3PO_4, or by means of a little H_2SO_4 or HCl. There may also be added $Na_4P_2O_7$, and substances such as gelatin, gums, glucose, and dextrin, giving improved deposits. Instead of H_3PO_4, substances generating it may be employed. A firm deposit may be produced by an electrolyte containing 50 g. of Sn salt per liter, the salt being dissolved in H_3PO_4 of 10% strength. Sn may be removed wholly from waste Sn plate, or partly from new plates coated by dipping, to economize Sn and impart a cryst. appearance. Ore may be used as anode or dissolved in the electrolyte.

Ger., 284,022, Aug. 16, 1913. Ges. für Chem. Ind. **Electrolysis of liquids, especially of alkali chloride solutions, with the use of tubular filter electrode elements.**

Ger., 284,046, Oct. 10, 1912. Elektrische Glühlampenfabrik "Watt," Akt.-Ges. **Process of mfg. electric incandescent lamps.**

Ger., 284,090, Jan. 16, 1914. Siemens-Schuckert-Werke G. m. b. H. In a method of **lighting mercury vapor lamps,** the metal vapor is ionized by means of a rotary current which is induced by high frequency electromagnetic oscillations around the vessel containing the vapor.

Ger., 284,146, Jan. 6, 1914. Regina Bogenlampen-Ges. m. b. H. App. for **preventing explosions in arc lamps with enclosed air,** whereby communication with the outer air is provided.

Ger., 284,238, Oct. 3, 1913. Körting & Mathiesen, A.-G. Device for **securing uniform burning away of electrodes of arc lamps,** especially in search lights and projection lanterns.

Ger., 284,341, Mar. 17, 1911. H. Andriessens and J. Scheidemandel. **Effecting chemical gas reactions** with the aid of a deformed arc, maintained between electrode ends which lie in a plane parallel to the axis of a magnetic flux, and forced by mechanical blast into the flux in the form of a sharp-angled band. In this manner the magnetic influence is effective in producing the longest possible non-rotary arcs over the smallest possible reaction surface.

Ger., 284,571, Feb. 4, 1912. H. Leiser. **Process of imparting to unfused tungsten or molybdenum the properties of the fused metals** by correcting the porosity of the unfused metals. This is effected by impregnating a sintered and shaped piece of W or Mo with a paste of amorphous or colloidal W or Mo, *in vacuo*, or by applying the paste by rubbing. If the piece which has been so treated be heated over the point of conversion from the amorphous modification into the cryst. variety, and this operation be repeated often enough, a completely non-porous product is obtained. The unfused W is heated preferably to above 1300° in order to impart an increased density and hardness to the metal. Instead of the W paste, a paste of Pt or Ir, or of a mixt. of these metals with W may be employed, since Pt and Ir, upon heating to 1100–1400° are converted into the cryst. form, thereby filling the pores. Furthermore, the Pt or Ir coating can be pptd. elec. upon the W or Mo surface.

5. PHOTOGRAPHY.

LOUIS DERR.

Colloid chemistry and photography. H. Lüppo-Cramer. Frankfurt. *Kolloid-Z.* 16, 111(1915); cf. *C. A.* 8, 874, 2124, 2986; 9, 1013; following abstr.—Emulsions of AgCl, AgBr, AgI or HgI_2 in gelatin are quickly coagulated by solns. of gum arabic

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AgCl and HgI_2 emulsions readily lose their coagulability on standing, AgBr in 24 hrs. and AgI in 10 days. Too high or too low degrees of dispersion of the Ag emulsion interfere with this coagulation, *i. e.*, there is an optimum degree of dispersion. Probably an adsorption comp. between gelatin and gum robs the gelatin of its protective action, and allows the Ag halide to coagulate. The foam-like structure of the Ag on a negative after it has been bleached by $HgCl_2$ is not the result of the bleaching (*Kais. Photo. Mitteilungen* 35, 29(1898)) but is simply made visible by rendering the Ag transparent and on blackening again with sulfite or NH_3 the structure again disappears. The crystalline structure of the photohalides is very much accentuated in AgCNS, which gives large crystals on warming with slight excess of NH_4CNS. H. I. MATTILL.

Colloid chemistry and photography. H. LÜPPO-CRAMER. Frankfurt. *Kolloid-Z.* 16, 150–62(1915); cf. preceding and following abstr.—The fact that the vapors of halogens or H_2O aid in "light ripening" of HgI_2 (cf. *C. A.* 8, 874) is due to the solvent action of the former and the fact that the latter increases the permeability of the collodion or gelatin, thus favoring the growth of the particles. The background on which a collodion suspension of Ag citrate (made from $AgNO_3$ and citric acid) is poured, has much to do with the sensitiveness of the preparation. On glass it becomes clear, forms large crystals on the surface and is insensitive, while on gelatin-coated paper it remains finely divided and sensitive. Probably the gelatin adsorbs the HNO_3, thus preventing the reversal of the reaction by which Ag citrate was formed. Paper fiber will have the same effect as gelatin. A plate made from a collodion suspension gives very thin negatives unless its permeability is increased by washing it in alcohol just before development, or coating with gelatin or gum solns. of glycerol, sugar or certain salts. Pure gelatin or gum without the crystalloid is not effective. A collodion emulsion is much less sensitive to physical development, and more sensitive to chemical development, after drying than while still wet, provided that before drying the collodion layer has been washed with H_2O until its surface is wet by the water; if it has not been so washed it is no more sensitive after drying than before. This is explained on the assumption that before drying the photohalide particles are less dense, and have a larger surface than after drying (agglutination ripening); therefore the Ag seeds made by the exposure to light of the wet plate give a greater effect with physical development than with chemical, and *vice versa* with dry plates. The action of Br absorbents in sensitizing collodion plates occurs only in the advanced stages of exposure when the Br pressure has reached a considerable height; consequently it is more effective for physical development which demands long exposure, than for chemical. This distinction disappears if the plate is very fine-grained so that long exposure is necessary for chemical development. The sensitizing action of tannin is not noticeable when a collodion plate is washed with a tannin soln., but is very marked if tannin is added directly to the emulsion and this exposed while wet. This is not due to reduction ripening, but to Br absorption during exposure. This difference is probably due to the difference in tannin dissolved in water (colloidal) and in alcohol (molecular), in which form it can better penetrate into the clumps of AgBr. If the tannin emulsion layer is washed, then covered with gelatin sugar soln. and dried, it is still sensitized to physical development but not to chemical, because of agglutination ripening. Ostwald ripening is impossible in a collodion emulsion. A collodion dry plate may be protected by colloids as gelatin, albumin, gum, etc., that prevent the too rapid crystallization of Ag from its supersaturated soln. during development. The wet collodion plate may still act as a protective colloid, but this property is largely lost on drying. The collodion emulsion contains no reduction nuclei. It undergoes solarization very readily. Dichroic fog is unknown. Impregnating with halogen absorbents entirely prevents reversal. The development with NH_3 is the same for

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collodion as for gelatin plates, as is also the sensitizing action of neutral salts as KNO_3, K_2SO_4, and the slowing with $KHCO_3$, $Na_2B_4O_7$ and Na_2HPO_4. Development with amidol fails because it depends on a reaction between amidol and gelatin. H. I. M.

Colloid-chemistry and photography. LÜPPO-CRAMER. Frankfurt. *Kolloid-Z.* 17, 26–8(1915); cf. preceding and following abstr.—*Photobromide formation by ripening.* A Lippmann plate exposed under 5% nitrite soln. till intensely colored is instantly bleached by H_2CrO_4 or HNO_3 but if the film is dissolved from the glass and boiled with dil. H_2SO_4 till the photobromide coagulates it is then very resistant to concd. HNO_3. This indicates that in the formation of a photobromide it is not necessary that the Ag should already be in a large molecular complex, but the coalescence of the colloid particles after exposure may lead to the same result. Similarly a photobromide may be formed by an Ostwald growth process, as when a very fine-grained emulsion after being bathed in 1% $NaNO_2$ or $AgNO_3$ is exposed several hours, then held over NH_3 vapor $^1/_2$ hr. On applying H_2CrO_4 or 2% persulfate to this plate the Ag protected from the NH_3 dissolves completely, but that which has been exposed to the NH_3 gives a rose-red photobromide. If in a daguerreotype process the Ag plate is exposed to I_2 avoiding an excess of I, and then after exposure to light is brought into contact with H_2O or I_2 vapor, a liquid condenses on the parts of the plate which have been acted upon by light, but not on the other parts, giving a temporary picture which, as the condensed liquid evaps., leaves the plate without any permanent change. This can be due only to the physical change of the highly dispersed AgI, and not to any chemical change. H. I. MATTILL.

Colloid chemistry and photography. LÜPPO-CRAMER. Frankfurt. *Kolloid-Z.* 17, 51–3(1915); cf. preceding abstracts.—Pulverizing AgBr by light (cf. *C. A.* 8, 1065). Very fine-grained Lippmann plates were bathed in KBr soln. and dried. Half of these were then washed free from KBr and dried again, to serve as controls. Exposed and developed with metol, the plate containing KBr is less sensitive than the control. Developed by exposure to NH_3, after 20–30 min. the KBr plate shows a sharp contrasty picture while the control is still faint. This illustrates the antagonism between the chemical and mechanical change of the Ag halide by light. Very old Lippmann plates which contain reduction nuclei are more sensitive to chemical than to NH_3 development, showing that the reduction nuclei have no effect in NH_3 development. H. I. M.

Artificial illuminants for use in practical photography. C. E. K. MEES. *J. Frank. Inst.* 180, 481–2(1915).—The following are recommended: for portraiture, flame arcs, Cooper-Hewitt lamps, and the nitrogen tungsten lamp; for motion pictures, the Cooper-Hewitt lamp, quartz arc, flame arc; for photoengraving and Ag printing, flame arc, enclosed arc; for Pt printing, the Cooper-Hewitt lamp. L. DERR.

Relative photographic and visual efficiencies of illuminants. L. A. JONES, M. B. HODGSON AND K. HUSE. *J. Frank. Inst.* 180, 484–7(1915).—Two tables, not capable of useful condensation, of the photographic value of various artificial lights as compared with sun and sky light. The best showing is made by the Hg arc in quartz, the "Artisto" C arc, and the Cooper-Hewitt lamp. L. DERR.

U. S., 1,158,011, Oct. 26. C. J. THATCHER. **A photographic developer** is prepared from *p*-aminophenol sulfate, alkali metal sulfite, Na_2CO_3 and about 3–10% as much NaOH as Na_2CO_3. The NaOH increases the rapidity of development.

Brit., 13,711, June 5, 1914. J. E. THORNTON. **For making prints on paper or other opaque supports of negatives taken through multi-color screens, the paper** or other support is prepd. with a single-layer printing-surface comprizing a great number of exceedingly fine dots or lines of colored, sensitized colloids or colored dots or lines

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which are subsequently sensitized. Registration with the printing negative is not necessary. Ag salts or dichromate salts may be used for sensitizing, and in the latter case, the colloid sheet can be sensitized subsequently to the formation of the colored dots. The use is exemplified of gelatin in conjunction with a dye of a type which does not render the gelatin insol. but which is mordanted by a dichromate sensitizing soln. Dots or grains of dyed gelatin are applied by a machine capable of printing or otherwise depositing the dots, so that they are exactly interspaced in a single layer but do not overlap. An alternate method of forming the colored dots is to take a plain gelatin layer, print 2 colors in lines or dots with self-mordanting dyes, and to fill in the spaces between by a third dye that soaks into the plain gelatin but does not affect the parts already printed. In the latter method, a certain amt. of overlapping may be allowed in forming the dots. When a Ag sensitizer is used, the printed screen surface is developed, fixed, soaked in a dichromate or other oxidizing soln. that renders the gelatin insol. in direct proportion to the amt. of Ag at the particular place and bleaches the image, and finally developing by hot H_2O from the back to remove the sol. gelatin. Cf. *C. A.* 8, 1551.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

Recent advances in the chemistry of cyanogen compounds. J. E. CLENNELL. *Bull. Am. Inst. Mining Eng.* 1915, 2115–28.—A review of recent work covering the application of cyanide solns. and the manuf. of cyanides. GEORGE W. MOREY.

Action of steam on sodium chloride. SOLOMON ENGLISH AND WM. E. S. TURNER. *Proc. Chem. Soc.* 30, 162(1914).—The decompn. of NaCl by steam was studied by passing steam over NaCl in a heated Pt crucible. There is no appreciable action below 500°, but the action becomes recognizable about 700° and increases regularly with rise in temp., as shown by measurements made up to 1000°. NaCl has an appreciable vapor pressure at its m. p., and the reaction appears to take place in the gaseous phase. In porcelain tubes the amt. of HCl formed exceeds the alkali left as residue, a circumstance for which the authors have been unable to find a reason. GEORGE W. MOREY.

Action of halogens on mercuric chloride. CHATEAU. Bordeaux. *Bull. soc. chim.* 17, 121–4(1915).—The substance obtained by treating $HgSO_4$ in H_2O with I, instead of being a complex compd., as stated in the literature, is a mixt. of $HgSO_4$.-HgO, $HgSO_4.HgI_2$ and HgI_2O_6. When Br is used, $HgBr_2$ is formed, and $HgCl_2$ when Cl is used. GEORGE W. MOREY.

Preparation of silicon chlorides. G. MARTIN. *Chem. News* 111, 208–10(1915). —Polemical. GEORGE W. MOREY.

A new series of compounds of tetravalent platinum (pentamminochloroplatinates). L. CHUGAEV AND N. WLADIMIROFF. *Compt. rend.* 160, 840–2(1915).—*Chloropentamminoplatinic chloride*, $[PtCl(NH_3)_5]Cl_3$, was prepd. by the action of liquid NH_3 on $(NH_4)_2PtCl_6$, and purified by crystn. It has a cond. intermediate between $[PtCl_2(NH_3)_4]Cl_2$ and $[Pt(NH_3)_6]Cl_4$. The *nitrate*, more sol. than the chloride, the *carbonate* and the *sulfate*, both insol. in H_2O, sol. in alkalies, were also prepd. GEORGE W. MOREY.

A new method of preparing chloro- and bromo-triamminoplatinous halides (Cleve's salts). LEO A. CHUGAEV. Petrograd. *J. Chem. Soc.* 107, 1247–50(1915). —Cleve's salt, $[PtCl(NH_3)_3]_2PtCl_4$, is prepd. by boiling 1 g. of *cis*-$[(NH_3)_2PtCl_2]$ (Peyron's chloride) in 18–20 cc. H_2O with 0.7 g. KCNO for about 2 min. To several portions so prepd., excess of HCl (d. 1.19) is gradually added, the whole heated to boiling, cooled,

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the unused $[(NH_3)_2PtCl_2)]$ filtered off, and excess K_2PtCl_4 added. This ppts. a mixt. of $[Pt(NH_3)_4]PtCl_4$ and $[PtCl(NH_3)_3]PtCl_4$; the latter is sepd. and purified by crystn. from hot H_2O acidified with a few drops HCl. When the Cl compds. are replaced by the analogous compds. of Br and the corresponding treatment carried out, $[Pt(NH_3)_4]$-$PtBr_4$ and a new *compd.* $[PtBr(NH_3)_3]_2PtBr_4$ are obtained. GEORGE W. MOREY.

Studies on cerium compounds. I. Basic cerium sulfate and the color of cerium dioxide. JAMES F. SPENCER. Regents Park, N. W., London. *J. Chem. Soc.* **107**, 1265–73(1915).—The hydrolysis of $Ce_2(SO_4)_3$ was studied at 25° by shaking a known amt. of $Ce_2(SO_4)_3$ with a dil. H_2SO_4 soln., for 7 days, removing and analyzing a known amt. of soln., adding more H_2O, and repeating the process. The compn. of the soln. and the CeO_2/SO_3 ratio in the solid phase was then calcd. The above ratio remained about 1:1 over a range of H_2SO_4 concn. of from 0.37 to 0.02 *N;* a portion of the solid phase removed gave a compn. of $CeO_2.SO_3.2H_2O$. Further treatment with H_2O results in more hydrolysis, but autoreduction takes place, causing the soln. to become one of 4 components. On heating $Ce_2(SO_4)_3$ to 195° a white basic salt of the compn. $3CeO_2.4SO_3$, which exists in 2 modification, is formed. When this basic salt is heated a long time below red heat a white CeO_2 is produced, which becomes yellow on ignition, with contraction in vol. GEORGE W. MOREY.

Reactions between potassium amide and certain salts of cadmium, nickel and chromium in liquid ammonia. GEORGE S. BOHART. Leland Stanford Univ. *J. Phys. Chem.* **19**, 537–63(1915).—B. describes the prepn. and gives the general properties (including some cryst. details) of a number of new compds.; most of them were prepd. by double decompn. between KNH_2 and a metal salt dissolved in liquid NH_3. *Potassium ammonocadmiate*, $Cd(NHK)_2.2NH_3$, was obtained from either CdI_2 or $K_2Cd(CN)_4$ with excess KNH_2; white flocculent ppt., which could not be obtained cryst.; insol. in liquid NH_3. *Cadmium amide*, $Cd(NH_2)_2$, from $Cd(SCN)_2$ or $K_2Cd(CN)_4$ with 1 equiv. KNH_2, turns orange, and is slowly decompd. in the air, forming $Cd(OH)_2$. *Cadmium nitride*, Cd_3N_2, a black amorphous ppt., was obtained by heating $Cd(NH_2)_2$ in vacuum to 180°; turns orange in moist air, and is decompd. explosively by H_2O. Pure $K_2Ni(CN)_4$ was obtained as light yellow cryst. by extg. with liquid NH_3 the residue obtained by evapg. a soln. containing $NiSO_4$ and the calcd. amt. KCN, and allowing the NH_3 to evap. When KNH_2 was added to excess $K_2Ni(CN)_4$, brownish red prismatic crystals of the *compound* $Ni_2N_2H_2K_4(CN)_6.8NH_3$ were obtained. At —40° this compd. has a very slight dissociation pressure, but at ordinary temp. all the NH_3 escapes, leaving a straw yellow powder of the *compound* $Ni_2N_2H_2K_4(CN)_6$. When KNH_2 and $K_2Ni(CN)_4$ are present in equiv. amts., a bright yellow, easily decompd. *compound* $NiNHK_2(CN)_2$ was obtained; with large excess of KNH_2 an emerald green soln. results, which changes to a deep red, with sepn. of bright red skeleton crystals of the *compound* $Ni_2N_{11}H_{22}K_7(CN)_2$. *Nickel thiocyanate tetraammoniate*, $Ni(SCN)_2.4NH_3$, which is rapidly altered by the air, *triammoniate*, deep blue crystals with vitreous luster, *diammoniate*, greenish blue cryst. with vitreous luster, and *5.5-ammoniate*, bluish violet vitreous tablets, rapidly decompd. by moist air, were all obtained by varying the concn. of NH_4OH in solns. containing $Ni(SCN)_2$. The *8.5-ammoniate*, bluish cryst., was prepd. by allowing a liquid-NH_3 soln. of $Ni(CNS)_2$ to evap. at —40°; it forms bluish crystals, with a dissociation pressure at —40° of about 7.5 mm. *Potassium ammononickelate*, $Ni_2N_2K_2.6NH_3$, red crystals, was obtained from $Ni(CNS)_2$ and KNH_2; excess of $Ni(CNS)_2$ yields *nickel amide*, $Ni(NH_2)_2$, insol. red flocculent ppt. *Nickel nitride*, Ni_3N_2, a black amorphous substance, was obtained impure by heating $Ni(NH_2)_2$ *in vacuo* at 120°. Several compds. are formed from KNH_2 and $(NH_4)_2Cr(SCN)_4$, but they could not be obtained pure. GEORGE W. MOREY.

The action of bromine on alkali iodides. N. RAE. Ceylon Medical College.

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J. Chem. Soc. 107, 1286–91(1915).—The action of Br on alkali iodides was studied by subjecting a weighed amt. of the iodide to the action of Br vapor in a desiccator, and detg. the change in wt. at frequent intervals. With NH_4I, Br is taken up until NH_4BrI_2 is formed, in harmony with the results of Jackson and Derby (*Am. Chem. J.* 24, 15(1900)), but a diminution in the speed of the reaction after the 1st atom of Br had been taken up, as noted by J. and D., was not observed. Similar results were obtained with KI, RbI and CsI, but NaI gave only NaBr and IBr. GEORGE W. MOREY.

Electro-oxidation of manganous salts and some compounds obtained thereby. M. SEM. *Z. Elektrochem.* 21, 426–37(1915).—See *C. A.* 8, 2988. G. W. M.

The solubility of palladium in selenic acid; palladium selenate. KARL HRADECKY. *Monatsch.* 36, 289–97(1915).—Finely pulverulent Pd dissolves in H_2SeO_4 (d. 2.0) at ordinary temp., more rapidly at high temp. Pure $PdSeO_4$ could not be prepd. by evapn. of a soln. obtained as above, but was prepd. by evapn. of a similar soln. containing HNO_3. It forms small, dark, brownish red, hygroscopic crystals, easily sol. in H_2O, sol. in acids, decompd. by HCl, sol. in NH_4OH, insol. in alkalies, EtOH, Et_2O. It tends to form double salts, *e. g.*, with $(NH_4)_2SO_4$. D. is 6.5; softens and begins to decomp. at red heat, decompd. on ignition, leaving a residue of Pd. H_2SeO_4 can be used for decomp. alloys of Au, Ag and Pd. GEORGE W. MOREY.

The reaction between calcium hydroxide and sulfur in aqueous solution. S. J. M. AULD. Reading. *J. Chem. Soc.* 107, 480–95(1915).—Lime-sulfur soln. was prepd. from $Ca(OH)_2$ and S by boiling in an atm. of N, and the resulting soln. was analyzed for total CaO, S as CaS_2O_3, S as CaS (S_M) and polysulfide S (S_P). When an excess of S is used the ratio $(S_M - S_P)/S_M$ is usually about 4.5–5, though it may exceed the latter fig. The compn. of the liquid is largely a function of the duration of boiling, the CaS_2O_3 tending to increase with loss of H_2S, due to hydrolysis. This reduces the S/CaO ratio; hence this ratio is dependent on the hydrolysis of the S_P, and consequently affords no indication of the course of the reaction or of the fungicidal value of the liquid. The S_P is loosely combined and may be continuously extd., either from soln. or from the residue on evapn., by C_6H_6, even in the absence of air or CO_2, due to continued hydrolysis. Some evidence was obtained pointing to the existence of CaS_2 in soln., but when attempts were made to prepare such a compd. by boiling $Ca(OH)_2$ and S in calcd. proportions Hershell's crystals were always obtained, and doubt is cast on the work of others who claim to have isolated CaS_2. The formula $CaS_2.CaO.7H_2O$ is given for Herschell's crystals. GEORGE W. MOREY.

Bismuth suboxide. W. HERZ. *Z. anal. Chem.* 54, 103(1915); cf. *C. A.* 9, 182. —Polemical. A mixture of Bi and Bi_2O_3 would have a d. of about 8.9, while H.'s prepn. had a d. of 7.88; hence it could not have been a mixture, as asserted by Treubert and Vanino. GEORGE W. MOREY.

Bismuth suboxide. F. TREUBERT AND L. VANINO. *Z. anal. Chem.* 54, 255–8 (1915).—A reply to Herz (cf. preceding abstr.). Reduction of $BiCl_3$ by $SnCl_2$ always gives a mixt. of Bi and Bi_2O_3; suboxide is not formed. GEORGE W. MOREY.

Bismuth suboxide. W. HERZ. *Z. anal. Chem.* 54, 413(1915).—Polemical (cf. preceding abstrs.). GEORGE W. MOREY.

Hydrous chromic oxide. II. C. F. NAGEL, JR. Cornell Univ. *J. Phys. Chem.* 19, 569–70(1915); cf. *C. A.* 9, 1571.—Solns. containing hydrous chromic oxide peptized by alkali are slowly pptd. on long standing, and by using a collodion ultra-filter it was possible to filter out the hydrous chromic oxide. $CrCl_3$ peptizes hydrous chromic oxide, without formation of basic chlorides; passing through a collodion filter removes the chromic oxide. Attempts to shake out the peptized chromic oxide with benzene or kerosene failed. GEORGE W. MOREY.

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Hydrate of arsine. DE FORCRAND. *Compt. rend.* 160, 467–70(1915).—By compressing AsH_3 with H_2O at 0° a cryst. hydrate was obtained. The following points on its dissociation pressure curve were detd.: 0°, 613 mm.; 1.6°, 760 mm.; 4.15°, 980 mm.; 10°, 2.65 atms.; 13°, 3.83 atms.; 18.25°, 6.79 atms.; 21°, 8.85 atms.; 28.3°, 17.5 atms. At 28.3° the dissociation pressure curve of the hydrate intersects the vapor pressure curve of AsH, giving rise to a "critical point of decompn." The mean value of the heat of formation of the hydrate, calcd. from the pressure curve, is 17.75 Cal., from which, by the aid of "de Forcrand's rule," the compn. of the hydrate is calcd. to be $AsH_3.6H_2O$. GEORGE W. MOREY.

Chromyl chloride. II. E. MOLES AND L. GÓMEZ. Madrid. *Anales soc. españ. fis. quim.* 12, 142–54(1914); cf. *C. A.* 7, 458.—CrO_2Cl_2 purified by distn. was observed to undergo no change when kept for 2 mos. without contact with air; no dark colored deposit or odor of Cl was detected. Freshly distd. CrO_2Cl_2 was then kept in 2 sealed tubes (one containing several drops of Hg) for 19 mos.; at the end of this period there was observed in each tube a very dark, amorphous and hygroscopic deposit which fumed in contact with air and possessed an odor similar to that of CrO_2Cl_2. Analysis indicated a slightly greater Cr content and slightly less content of Cl than would correspond to CrO_2Cl_2. The change which occurred evidently does not correspond to the hypotheses of Thorpe and of Etard (decompn. of CrO_2Cl_2 into (1) trichromyl chloride and Cl and (2) CrO_2 and Cl, resp.). The black deposit probably consisted of a solid polymer of CrO_2Cl_2 with possibly a small amt. of $(CrO_2)_3Cl_2$. The deposit in the tube which contained Hg was apparently similar to the above with the exception that it left a dark residue (probably Hg_2CrO_4 with some Hg) which was insol. in H_2O; HgCl (probably formed if free Cl was present) was not observed. The liquid which remained in the tubes was unchanged; it b_{760} at 116.7° as originally. The Cr and Cl contents of carefully purified CrO_2Cl_2 were found to be 33.72 and 45.84%, resp. These results agree very closely with the theoretical contents; the considerable discrepancy between the latter and the results of Thomson, H. Rose, Walter and Thorpe are doubtless due to impurity of the CrO_2Cl_2 employed. Values of n for CrO_2Cl_2, either pure or dissolved in $PhNO_2$, could not be obtained because of excessive absorption of light. The heat of soln. of CrO_2Cl_2 was detd. by the Berthelot method and was found to be 17.86 cal. as compared with 16.7 cal. found by Berthelot. M. and G. also made cryoscopic studies of CrO_2Cl_2 with CCl_4, $SnBr_4$ and $SbCl_5$ as solvents and ebullioscopic studies with CCl_4 and CS_2 as solvents. The cryoscopic behavior of CrO_2Cl_2 in CCl_4 is quite similar to that observed when CrO_2Cl_2 is dissolved in $PhNO_2$ or $C_2H_4Br_2$. The values of M are excessively high, but diminish with increasing concn. of the soln. This peculiarity is probably due to the tendency of CrO_2Cl_2 to polymerize. Humidity of the air catalyzes this polymerization in a manner similar to the catalysis of the polymerization of SO_3 by a trace of acid (formed in presence of humid air). The products of polymerization are much less stable at higher temps., so that the mol. wt. deduced from the vapor density is normal, while the values of Mc detd. by ebullioscopy in CCl_4 and CS_2 differ little from the theoretical. The values obtained with $SbCl_5$ as a solvent are similar to the preceding, the values of M being excessively high and decreasing with the concn.; in view of the slight stability of these solns. it is probable that this anomaly is due to chem. change. The results obtained with $SnBr_4$ as a solvent are very similar to those observed by Beckmann in the case of SnI_4, SbI_3 and AsI_3 in $SbCl_3$. In all these cases the observed mol. wt. was approx. $^1/_2$ the theoretical. The greater chem. affinity of Cl suggests the interchange of halogen atoms between the solvent and the dissolved substance. It is, further, probable that ionic dissociation also occurred, since $SnBr_4$ is a good dissociating medium. The ebullioscopic studies of CrO_2Cl_2 in CCl_4 and CS_2 indicated that, contrary to Etard's observation, there is no chem. action between

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CrO_2Cl_2 and these solvents. The cryoscopic consts. taken for CCl_4, $SnBr_4$ and $SbCl_5$ were 2.98, 28.0 and 17.5, resp.; the ebullioscopic consts. for CCl_4 and CS_2 were taken as 5.26 and 2.37, resp. Normal mol. wts. were obtained when a correction was applied so that the usual formula $\Delta = K.g/M$ was changed to $\Delta = (1 - a).K.g/M$ (a = the quotient c_1/c_2 of the concns. of the dissolved substance as vapor and liquid, resp.), anomalous results due to the high vapor tension of CrO_2Cl_2 being obtained before this correction was applied. A relation between the values of a and the color of the solns. is indicated. A certain analogy between solns. of I and CrO_2Cl_2 in the relation of various properties (difference in color, cryoscopic and ebullioscopic behavior) is also indicated and will be investigated later. H. S. PAINE.

Complex and basic lead salts. Solubility of lead sulfate in ammonium acetate solutions. C. BLOMBERG. Amsterdam. *Chem. Weekblad* 11, 1030–4(1914).—The soly. of $PbSO_4$ in NH_4OAc solns. and the formation of basic Pb salts is explained by the tendency of Pb^{++} to be held in soln. as a complex ion such as $PbAc_3^-$. G. W. M.

Hydrolysis of zinc chloride. ALFREDO SORDELLI. Buenos Aires. *Anales soc. quim. Argentina* 2, 97–112(1914).—Addition of H_2O to concd. solns. of $ZnCl_2$ does not cause pptn. of a basic salt as is indicated by the expts. of Perrot. Pptn. of this basic salt ($2ZnCl_2.11ZnO$) occurs when the solns. contain an excess of ZnO. The mechanism of the pptn. may be interpreted by means of the Guldberg-Waage law. The displacement of the equil. by variation in temp. indicates that the pptn. of the oxychloride is an exothermic reaction. The const. of hydrolysis has a very small value even at 100°; hydrolysis increases with rise in temp. H. S. PAINE.

Action of thionyl chloride on sulfides. H. B. NORTH AND C. B. CONOVER. *J. Am. Chem. Soc.* 37, 2486–90(1915); cf. *C. A.* 7, 2363.—Pptd. sulfides (except FeS) were heated with $SOCl_2$ at 150–180° in sealed tubes, and the products analyzed. The reactions for ZnS, CuS and CdS were exactly similar: $CdS + 2SOCl_2 = CdCl_2 + SO_2 + S_2Cl_2$; Ag_2S gave AgCl just as in the Cd reaction; As_2S_3 and Sb_2S_3 gave: $As_2S_3 + 6SOCl_2 = 2AsCl_3 + 3SO_2 = 3S_2Cl_2$. The reaction with FeS differed somewhat from the others: $6FeS + 16SOCl_2 = 6FeCl_3 + 8SO_2 + 7S_2Cl_2$. A tube in which SnS_2 had been heated with $SOCl_2$ evolved SO_2 when opened and the odor of S_2Cl_2 was very prominent, so that probably it reacted as in the other equations, giving $SnCl_4$. There is thus a selective action, as with the oxides and metals. E. B. MILLARD.

Action of sulfides on nitroprussides and the nature of the colored substances produced. José GIRAL PEREIRA. Salamanca. *Anales soc. espaň. fis. quim.* 13, 27–46, 69–82(1915).—Solns. of Na nitroprusside and Na_2S in MeOH yield a violet ppt. which is very hygroscopic and is readily oxidized by air. An analogous derivative is produced in the case of K_2S, the reaction corresponding to the equation: $(CN)_5Fe(NO)Na_2.2H_2O + 2K_2S = (CN)_5FeNa_2K_4S_2.2H_2O + NO$. H. S. PAINE.

Interaction of atacamite with ammonium bromide. S. CHUMANOV. *J. Russ. Phys. Chem. Soc.* 47, 1269–72(1915).—Atacamite interacts with concd. solns. of NH_4NO_3, $(NH_4)_2SO_4$, $HgCl_2$, NH_4I, or NH_4Br, giving both sol. and insol. compds. With NH_4Br the insol. *salt* is cryst. and approx. corresponds to $Cu(NH_4)_4Br_2$, while the sol. compd. is a yellowish green cryst. substance whose compn. was not definitely established. H. M. GORDIN.

Transformation of aluminium silicates under influence of salt solutions at temperatures up to 200° (SCHNEIDERHÖHN) 8. Indexes of migration of the ions and transport of ammonia in ammoniacal solutions of silver nitrate (REYCHLER) 2.

JEFFERY, F. H.: **Notes on Elementary Inorganic Chemistry.** New York: G. P. Putnam's Sons. 55 pp. $0.60.

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7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Progress in the field of metal analysis in 1914. TH. DÖRING. *Chem. Ztg.* 39, 725–7, 734–7(1915).—A review of methods, with bibliography. J. H. MOORE.

The use of ninhydrin in volumetric analysis. A. BOLLAND, Cracow, AND E. NOBEL, Vienna. *Chem. Ztg.* 39, 727(1915).—When a soln. of peptone and ninhydrin in H_2O is boiled a bright blue color appears which is discharged by adding HCl, the amt. of HCl required being nearly proportional to the amt. of peptone present. Attempts to use this indicator for the quant. detn. of albumin in urine and eggs failed. Soda solns. may be titrated with HCl and HNO_3 by adding 5–10 drops of indicator made by boiling 20 cc. of 0.2% peptone soln. with 4 drops of 1% ninhydrin soln. and keeping the soln. nearly boiling. The end point with H_2SO_4 is not sharp. J. H. MOORE.

Copper cathode in electroanalysis. JULIO DE GUZMÁN CARRANCIO. *Anales soc. españ. fis. quim.* 12, 297–305(1914).—A Cu electrode may replace one of Pt without loss of accuracy in the detn. of Cu, Ni, Co, Zn, Cd and Ag. H. S. PAINE.

The subject "borax and metal salts" as treated in analytical text books. L. VANINO. *Z. anal. Chem.* 54, 408–9(1915).—V. calls attention to the conflicting statements in text books concerning the nature of the ppt. obtained by adding borax soln. to a metal salt soln., and points out that the actual product is detd. by the various conditions which affect the amt. of hydrolysis. GEORGE W. MOREY.

Note on the ignition of magnesium pyrophosphate. L. A. CUTHBERT. *J. Am. Leather Chem. Assoc.* 10, 459–60(1915).—To char the paper without burning it, C. operates as follows: invert a 2-in. porcelain crucible cover and place in a larger size porcelain crucible (preferably one with a $3^1/_4$ in. diam. at top, $1^1/_8$ in. at bottom, 2 in. height). Place the moist ppt. and filer paper in a Pt crucible and set the crucible on the inverted porcelain cover; heat slowly at first to expel H_2O, and when dry, heat over a Méker burner or blast lamp until the paper is charred; remove the Pt crucible and ignite in the usual manner to const. wt. [The advizability of using a Pt crucible for igniting $Mg_2P_2O_7$ in the presence of C is questioned.—ABSTR.] F. W. SMITHER.

A new reagent for the detection and colorimetric estimation of aluminium. F. W. ATACK. *J. Soc. Chem. Ind.* 34, 936–7(1915).—A 0.1% soln. of alizarin S, which is pale yellow in presence of acids and purple in presence of alkalies, is useful as an indicator in certain acidimetric detns. To about 5 cc. of the neutral or acid soln. under examn. add 1 cc. of this reagent, then NH_4OH till alk., boil for a few moments, allow to cool, and then acidify with dil. AcOH. A red color or ppt. remaining is a certain indication of Al. Salts of Ca, Sr, Ba, Zn, Mg and all other metals later than group II do not interfere with the color. If Co is present (*C. A.* 9, 2363) an excess of NH_4OH must be avoided. The reagent will detect 1 pt. Al in 10 million pts. of H_2O. Phosphates and Cr do not interfere, nor does Fe unless present in comparatively large amts. For example, 0.003 mg. Al were readily detected in the presence of 1 mg. Fe as ferric salt and 10 mg. Cr as Cr salt. Citric acid can be used to keep larger amts. of Fe in soln. It is unwise to attempt the sepn. as hydroxide before detection since all comm. samples of Na_2O_2, NaOH and H_2O_2 contain traces of Al. Cr compds. also, even Kahlbaum's purest guaranteed $K_2Cr_2O_7$, contain traces of Al. *The colorimetric quantitative estn.* is not affected by moderate amts. of Ca, Mg or Zn salts, but is interfered with by large amts. of Cr, Fe and phosphates. Pptn. which takes place most readily in presence of other metals, is prevented by glycerol. A very large excess of alizarin S must be employed, and the colorations must be compared within a very short time of their formation, as the AcOH gradually attacks the finely divided ppt., more particularly in the presence

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of phosphates. *Method:* Acidify the original soln. (5 to 20 cc.) with HCl or H_2SO_4, add 10 cc. glycerol and 5 cc. of 1% alizarin S. Make up to about 40 cc. and then render slightly ammoniacal. Allow to stand 5 min., acidify with dil. AcOH (till no further change in color takes place), make up to 50 cc. and compare with a standard. Suitable amts. of Al for estn. are from 0.005 to 0.05 mg. E. G. R. ARDAGH.

Ignition of ferric oxide in the gravimetric determination of iron. E. SELCH. *Z. anal. Chem.* 54, 457–63(1915).—On igniting Fe_2O_3 (obtained by dissolving weighed amts. of $(NH_4)_2Fe(SO_4)_2.6H_2O$, in H_2O, oxidizing with HNO_3, pptg. with NH_4OH, filtering, and washing) in inclined Pt crucibles with free access of air, Fe_2O_3, const. wt. (agreeing with wt. taken) was reached on blasting 15 min.; a Teclu burner and a Méker burner after 1 hr. each gave values 1 to 3 mg. too high, when operating on about 0.4 g. Fe_2O_3. On heating about 2 g. of the salt direct with the same burners for same time periods, the results were satisfactory in each case, showing complete expulsion of SO_4. On heating Fe_2O_3 in covered crucibles placed vertically and surrounded by the flame the loss due to reduction amounted to from 3.39 to 7.64% of the Fe_2O_3 present. *Conclusions:* (1) Reducing flame conditions must be avoided in igniting Fe_2O_3; the crucible must not be completely enveloped in the flame and the cover should be so placed as to give free circulation of air within the crucible. (2) The use of the blast lamp is recommended. (3) On reheating the weighed Fe_2O_3 for several hrs. over a Bunsen burner in an open crucible, there should be no gain in wt. (shows absence of any reduction). F. W. SMITHER.

Reduction of ferric salt solutions and titration with potassium permanganate. A. HOENIG. *Z. anal. Chem.* 54, 441–57(1915).—A review of the literature followed by an exptl. study. Electrolytic Zn, though free from carbide, is not suitable as a reducing agent, since it contains Fe, Pb, etc., and leaves after soln. a residue of Pb sludge, giving high results. Mg, like Zn, ppts. Fe and must be dissolved to effect complete reduction. However, Mg gives high results owing to the presence of carbides. Al contains Fe, it ppts. Fe, so that complete soln. must be effected, and it contains carbides. A study of the reduction of Fe'' by means of Ag in H_2SO_4 soln., varying the temp. and concn. and pptg. Ag with $MnCl_2$ soln., showed that the reduction is not complete and the process inaccurate ($Ag + Fe'' \rightleftharpoons Ag' + Fe'$). The following procedure yields accurate results: To the fairly acid (HCl) soln. of $FeCl_3$, containing not more than 0.4 g. Fe, in a volumetric flask, add 3–4 g. of Ag powder or electrolytic Ag (foil will not answer), boil till colorless, dil. with hot H_2O, cool, make up to mark, mix, and let settle. Transfer an aliquot to a flask containing 100 cc. H_2O and 25 cc. of "titrating mixt." (170 g. $MnSO_4.5H_2O$ dissolved in H_2O + 400 cc. H_3PO_4 (d. 1.7) + 340 cc. H_2SO_4 (d. 1.8) + H_2O to 2.5 l.), that has been previously titrated to a faint color with 1 or 2 drops of $KMnO_4$, and titrated in the usual manner with $KMnO_4$. The non-oxidized Ag in the residue is recovered by washing with H_2O, then dil. NH_4OH followed by H_2O, boiling with dil. H_2SO_4, washing and drying. The method of Gintl (*Z. angew. Chem.* 15, 431 (1902)) using Pt-black effects complete reduction of Fe'', even in concd. solns. H. using Pd foil and passing H through the hot soln. confirmed Gintl's results with Pd spiral (*Z. anal. Chem.* 42, 391(1903)); the reduction is very slow, about $1/6$ of the Fe'' after 8 hrs. With $PdCl_2$ and H after 5 to 10 hrs. the reduction was small. The Zimmermann-Reinhardt method, using $SnCl_2$ followed by $HgCl_2$ gives high results owing to the diln. required and the action of HgCl on $KMnO_4$. The method of Vortmann-Padberg (*Ber.* 22, 2642(1889)) gives accurate results when executed as follows: Heat 50 cc. of the Fe'' soln., containing at least 10 cc. of concd. HCl per 50 cc., in a volumetric flask, add $SnCl_2$ soln. dropwise till colorless, let cool somewhat, add 2 g. of flowers of S, boil 1 to 2 hrs. under a reflux condenser, passing a current of CO_2 through the soln. Cool to room temp., make up to mark, mix; transfer an aliquot to a flask containing

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100 cc. of H_2O and 25 cc. of "titrating mixt." (as above), and titrate with $KMnO_4$. Tables of results and a bibliography are given. F. W. SMITHER.

Influence of dilution of hydrogen peroxide on the velocity of precipitation of manganese from ammoniacal solutions in the presence of zinc. A. J. WALKER AND W. FARMER. *Proc. Chem. Soc.* 30, 139–40(1914).—A study of the effect of the diln. of the H_2O_2 soln. in Jannasch's method for the sepn. of Mn and Zn showed that with a time-limit of 30 min. the pptn. of Mn as $MnO(OH)_2$ is complete with H_2O_2 concn. of from 2.5 to 6%. With H_2O_2 concn. of less than 2.5% the Mn is not completely pptd., the amt. of the effect increasing with the diln. The Mn is subsequently pptd. with the $ZnCO_3$. GEORGE W. MOREY.

Volumetric determination of potassium and its application in analysis of fertilizers. G. AJON. *Ann. stas. sper. di agrumicoltura e frutticoltura di Acireale* 3, 91(1915); through *Ann. chim. applicata* 4, 132–3.—Put into a 150–200 cc. Erlenmeyer flask 25 cc. of a 2% KCl or K_2SO_4 soln. (equiv. to 1.26–1.08% K_2O), add slowly, while agitating, 50 cc. 2*N* tartaric acid, and then 25 cc. 0.5 *N* NaOH soln. Shake for 5 min. with a rotary motion; then add, little by little, while still shaking, 25 cc. 96% EtOH and let stand for 6–8 hrs. Decant the liquid through a 9 cm. barytes filter (Dreverhoff No. 400), wash the ppt. 6 times by decantation with neutral 96% EtOH, remove the filter from the funnel and place in the beaker contg. the ppt. using phenolphthalein, titrate with 0.1 *N* NaOH in EtOH, to alk. reaction. The end red color should persist for 5 min. Then dissolve the ppt. in 0.1 *N* aq. NaOH soln. and titrate the excess by means of 0.1 *N* HCl. The number of cc. NaOH used for the soln. of the bitartrate, multiplied by 0.00474, gives directly the amt. of K_2O present. The method yields exact results. S. LEVY.

The quantitative determination of nickel with dimethylglyoxime. KARL WAGHMANN. *Ferrum* 12, 126–9(1915).—A summary of the process is as follows: (1) Ppt. the Ni in hot soln. with dimethylglyoxime (5 times the quantity of Ni in about 100 cc. H_2O). Let stand 24 hrs. in the cold. Then filter and wash. Dissolve in 50 cc. warm H_2SO_4 (about 1:10) and wash the filter with hot water. After adding a few drops of HCl and of H_2O_2 boil 5–10 min. Neutralize the soln. with NH_4OH and add 25 cc. in excess. Then electrolyze with a rotating cathode at 70–80° (c. d. 5.0 amp., speed of rotation 800–1000). Time required is 20 min. for 0.2 g. Ni. The method avoids the troubles attending the use of Gooch crucibles and gives accurate results. CARLE R. HAYWARD.

Copper sulfate determination in blue vitriol. G. INCZE. *Z. anal. Chem.* 54, 412–3(1915).—A correction (cf. *C. A.* 9, 2203). GEORGE W. MOREY.

Determination of alumina in silicates. EMMERICH SELCH. Vienna. *Z. anal. Chem.* 54, 395–403(1915).—The silicate is decompd. by evapn. with HF, twice taken into soln. and evapd. to dryness with dil. H_2SO_4, and Al_2O_3 detd. in the soln. of the residue by pptn. with NH_4OH as usual. Results given agree with those obtained by fusion with Na_2CO_3 in the usual way, after the latter had been corrected for their SiO_2 content by treating with HF, H_2SO_4, and ignition. Contrary to various authors, there is no loss of Al_2O_3 by volatilization by the above HF-H_2SO_4-ignition treatment. GEORGE W. MOREY.

Quantitative determination of fluorine. W. H. ADOLPH. *J. Am. Chem. Soc.* 37, 2500–15(1915).—The usual pptn. of CaF_2 with $CaCO_3$ to facilitate filtering, and the subsequent removal of the CaO after ignition with 1.5 *N* HOAc led to the loss of 1.5 mg. of CaF_2 for 10 cc. of the acid. When SiO_2 has been added to a CaF_2 fusion and later removed by evapn. with $(NH_4)_2CO_3$, it was shown that no F was lost as NH_4F. A second fusion with Na_2CO_3 of the insol. residue of a CaF_2 fusion with Na_2CO_3 removed nearly all the F, but a re-fusion with KOH or NaOH did not remove any of it. In the

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volatilization of SiF_4, 98.6% H_2SO_4 gave much better results than the "96%" acid usually employed. The more concd. acid was prepd. by evapg. off 0.1 of the vol. of the 96% acid. A stronger acid made by the addition of SO_3 gives off the trioxide on heating and is difficult to condense. A temp. of 200–220° was most desirable for driving off SiF_4; the addition of anhydrous $CuSO_4$ or P_2O_5 as a "dehydrating" agent in the decomp. flask was without apparent effect. The results with quartz sand were better than those in which pptd. SiO_2 or feldspar were used, but the best ones were about 1% low. All of the details of the Offermann method are given. No satisfactory results were obtained by pptn. as ThF_2; a small amt. of Na_2ThF_6 was apparently formed with the ThF_4. The Steiger-Merwin method, in which the color produced by H_2O_2 and a Ti soln. is faded by F, was the only satisfactory one for detg. F in small quantities in minerals. Sol. fluorides can be detd. most accurately by pptn. as PbFCl in neutral soln. (Cf. Starck, *C. A.* **5**, 2049.) E. B. MILLARD.

The quantitative determination of phosphorus by means of nascent hydrogen. ANTIPAS ERICSSON. *Svensk Farm. Tidskrift* **19**, 449–54(1915).—By virtue of the reactions $P_4 + 6H_2 = 4PH_3$ and $PH_3 + 3AgNO_3 = Ag_3P + 3HNO_3$ yellow P or the P of metals and alloys can be readily detd. after a manner similar to that described for As (*C. A.* **8**, 35; **9**, 278). A generating flask provided with a separatory funnel is connected with a wash bottle containing dil. NaOH; beyond this is placed a condensation tube holding 0.1 *N* $AgNO_3$. Between the 2 latter is a loose plug of cotton moistened with $Pb(OAc)_2$. Any H_2S generated from the sample is arrested in the wash bottle. In samples of yellow P the P is brought into soln. with 96% AcOH immediately before the detn. is made, and poured through the funnel and then rinsed with HCl. The current of H should flow 5 min. before the sample is added. About 20 min. is required for completion of the reaction, which may be tested by disconnecting and allowing the gas to play on $AgNO_3$ paper for 30 sec. A black ppt. of Ag_3P forms in the condensation tube; this is filtered and washed and then dissolved with warm 60% HNO_3 and the Ag detd. by the Volhard method. For 1 mg. As, if present, 0.8 cc. of the standard soln. is to be subtracted. In the same weighed sample the reduced Fe remaining in the generating flask is estimated by titrating with $KMnO_4$. In analyses of Mg (cf. *C. A.* **8**, 35), only about 50% of the P passes over as PH_3 the remaining P forming an unknown PH_x (cf. *C. A.* **8**, 35). This is collected on a long cotton plug placed beyond the condensation tube and well moistened with a strong soln. of $AgNO_3$; the ppt. is dissolved in 60% HNO_3 and an approx. estimate of the P obtained. A. R. ROSE.

Determination of gases dissolved in waters and effluents. A. A. SWANSON AND G. A. HULETT. *J. Am. Chem. Soc.* **37**, 2490–2500(1915).—A speeial app. has been designed to contain 0.5 liter of the water and the same vol. of Hg in a pipet, arranged in such a way that the loss or gain of gases is prevented. The Hg is withdrawn from the pipet, and the gases dissolved in the liquid are brought to equil. with the vacuum above the H_2O by a few min. of violent shaking. Then the gaseous mixture may be analyzed in a special buret, and the concn. of each gas calcd. from these data and Henry's law. Care was taken to prevent a change of pressure on the system during the transfer of the gas from the pipet to the analyzing app. Dissolved O as detd. by this method checked parallel detns. by the Winkler method, and the results of the new method were reproducible. Similar tests of the method against the Seyler method for CO_2 gave satisfactory results, and the detn. of dissolved N was shown to be reproducible. Further expts. in another app. are given in which the equil. is established by shaking in an atm. of H or N in place of the vacuum. E. B. MILLARD.

The titration of tartaric acid with permanganate. R. S. DEAN. *Chem. News* **112**, 154–5(1915).—Tests indicating that the intermediate compd. formed in the ordinary titration of tartaric acid by $KMnO_4$ is HCOOH, and since the reaction is susceptible

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to induction, $FeSO_4$, H_2O_2, and HNO_2, were tried to induce the reaction to completion. Of these HNO_2 was found to be most efficient, but the oxidation to CO_2 and H_2O was not complete. The tartrate could not be completely oxidized in alk. soln. If the tartrate be titrated in acid soln. as far as possible, then neutralized and the titration finished, the oxidation to CO_2 is complete. *Method:* Make the tartrate soln. just acid with 3 cc. HNO_2 and titrate boiling to a permanent pink; neutralize till just acid, add $Zn(NO_2)_2$, and titrate with $KMnO_4$ as in the Volhard method. The method gives good results, although the reaction is somewhat slow and requires considerable boiling. An approx. idea of the amt. of $KMnO_4$ necessary may be had by dividing the amt. required to produce a permanent pink in acid soln. by 2; this amt. may then be added at once, and the remainder dropwise. $KMnO_4$ soln. was standardized against $Na_2C_2O_4$ and had a value for 1 cc. between 0.00318 and 0.00676 g. $Na_2C_2O_4$. F. W. SMITHER.

A very sensitive color reaction for atropine, hyocyamine and scopolamine. R. WASICKY. Vienna. *Z. anal. Chem.* 54, 393–5(1915).—Schaer's reagent (1 vol. perhydrol to 10 vol. concd. H_2SO_4) quickly gives an intense leaf green, changing to an olive green color with the above alkaloids; homatropine and cocaine also give the reaction but in the case of the latter the reaction goes more slowly, and the color produced is an emerald green. A more sensitive reagent is *p*-dimethylaminobenzaldehyde (2 g. in 6 cc. concd. H_2SO_4 + 0.4 g. H_2O) which gives color reactions with a number of alkaloids. The atropine, etc., reaction (an intense stable cherry- to violet-red coloration) is characteristic. Under the microscope the coloration is visible with particles down to 20μ diam. GEORGE W. MOREY.

Estimation of alcohol in ether. P. SZEBERÉNYI. *Z. anal. Chem.* 54, 409–11 (1915).—Small amts. of EtOH (1–4%) in Et_2O are detd. by oxidation with $K_2Cr_2O_7$. Dilute 5 cc. of the Et_2O with H_2O to 100 cc. and place 30 cc. of the soln. in a 500 cc. flask containing 10 cc. 0.5 *N* $K_2Cr_2O_7$ soln., 20 cc. 1:1 H_2SO_4, and 40 cc. H_2O and boil for 15 min. under a reflux condenser. Cool the soln., dil. to 200 cc., add 20 cc. 5% KI soln. and titrate the liberated I with 0.5 *N* $Na_2S_2O_3$, using starch as indicator. Each 0.1 cc. of $K_2Cr_2O_7$ soln. corresponds to 0.64 mg. EtOH, but a blank must be run under the same conditions on pure Et_2O. The value 0.6–0.9 cc. is given as a usual blank, and it is stated that the method is good to about 0.3%. GEORGE W. MOREY.

Artificial daylight for the microscope (GAGE) 19.

BAUER, O. AND DEISS, E.: **The Sampling and Chemical Analysis of Iron and Steel.** Trans. by W. T. Hall and R. S. Williams. New York: McGraw-Hill Co. 373 pp. $3.00.

MORGAN, J. J.: **Aids to the Analysis and Assay of Ores, Metals, Fuels, Etc.** 2nd ed. London: Baillière, Tindall and Cox. $0.75.

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8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

The determination of mineral and rock densities at high temperatures. A. L. DAY, R. B. SOSMAN AND J. C. HOSTETTER. Geophys. Lab., Washington. *Neues Jahrb. Min. Geol.* 40 (*Beil.-Bd.*) 119–62(1915); see *C. A.* 8, 886. E. T. W.

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Dissociation of calcium carbonate below 500°. R. B. SOSMAN, J. C. HOSTETTER AND H. E. MERWIN. *J. Wash. Acad. Sci.* **5**, 563–9(1915).—The original intention of demonstrating a difference of CO_2 pressure between calcite and aragonite below the transition temp. was not accomplished, though the CO_2 pressures showed certain regularities. Two forms of CaO are described. That variety obtained by heating Iceland spar at 700° and pumping out the CO_2 is fine-grained and porous, has a refractive index of 1.725 to 1.77, and is very reactive. After heating to 1400° it absorbs H_2O less readily, and shows an index of 1.79 to 1.81. The second variety was obtained by carefully dehydrating $Ca(NO_3)_2$, melting it, and gradually raising the temp. until all the NO was driven off. The resulting crystals are isotropic cubes and octahedra, index 1.83, and of much lower reactivity. The latter form is the more stable one at higher temps., and there are indications of an inversion point (perhaps similar to the inversion between high- and low-temp. quartz) between 400 and 430°. The porous lime unites readily with dry CO_2 and the compd. dissociates readily with rizing temp., while the cryst. variety unites slowly with CO_2 and the compd. dissociates slowly. The latter dissociation does not seem to be hastened by the presence of Fe_2O_3 or CaO. Aragonite is transformed into calcite within an hour at 425° in a vacuum furnace. The dissociation pressures of cryst. $CaCO_3$ at 400° are of the order of magnitude of 0.003 to 0.009 mm. E. B. MILLARD.

Electrical resistance of subterranean waters. Study of curve of dilution. C. PIERI. Pisa. *Ann. chim. applicata* **4**, 93–111(1915).—P. studied the elec. resistance of solns. of KCl, NaCl, $MgSO_4$, $CaCl_2$, $CaSO_4$, plotting the values as ordinates and the vols. of diln. (made in an arithmetical progression) as abscissas, forming characteristic curves of diln. At his final dilns. dissociation was practically complete. Curves of diln. were also found for certain well waters and subterranean streams at different seasons of the year. The different forms which the curve took for samples at different times are probably due to the greater or less hydrolysis of the carbonates in soln. that varies with the quantity of CO_2 present. The amt. of CO_2 increased from April to Nov., the large quantities present in the Nov. samples coming probably from the increased fermentation that took place in the interior of the soil, while the small amts. in the April samples were due to the little saprophytic activity of the micro-flora of the soil, on account of the low temp. of the superficial layers, and consequently the lack of disintegration of dead material, the principal source of CO_2. P. believes that his expts. do not confirm the idea that the measurements of elec. cond. will lead to the identification of subterranean waters, but on the other hand, they confirm the thought that such waters can be better characterized and observed by their curves of diln., followed out periodically. S. LEVY.

New minerals. R. KOECHLIN. *Min. petr. Mitt.* **33**, 193–9(1915).—A compilation of the descriptions of recently announced minerals. All but three of these appear to have been recorded in *C. A.*; the articles concerning them are abstd. below. A. D. BROKAW.

A new mineral deposit in Brazil. H. ARLT AND H. STEINMETZ. Munich. *Z. Kryst. Min.* **54**, 590–606(1915).—Minerals from Bom Jesus des Meiros, Province Bahia are described crystallographically. The deposit is characterized by rare-earth minerals. Granite-pegmatites abound, but the deposit stands between the pegmatite type and the Alpine type. It indicates a magmatic period characterized by the formation of quartz with magnesite, dolomite, monazite and xenotime, that gave way to a pneumatolytic phase characterized by dark tourmaline, topaz, beryl, and Li-mica. Numerous references to other similar mineral occurrences are given. A. WANDTKE.

The action of hauerite on silver and copper. E. QUERCIGH. Univ. Turin. *Atti accad. Lincei* **24**, I, 226–31(1915); cf. Beutell, *C. A.* **8**, 1074.—The blackening of Ag

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and Cu also occurs when the action of the air is excluded by means of a layer of toluene during the grinding and polishing of the metal and mineral surfaces and while the two are in contact. With the action of air thus excluded the blackening must be due (1) to a reaction between the solid hauerite and Ag or Cu, (2) to a transfer of S through the toluene, or (3) to the presence of free H_2S in the mineral. (3) is excluded because the hauerite shows the same effect even after prolonged washing with toluene; (2) is excluded since no S could be found in the toluene even after long contact with hauerite; Q. therefore favors (1). E. J. WITZEMANN.

Arsenopyrite and bournonite from Rozsnyo. KARL ZIMANYI. Budapest. *Math. term. Értisitö Mag. Akad. Wiss.* 32(1914); *Z. Kryst. Min.* 54, 578–83(1915).—The arsenopyrite contains Ni, Co and Pb and occurs with chalcopyrite, tetrahedrite and muscovite. The bournonite is quite different in habit from that of other Hungarian occurrences; with it, tetrahedrite is common, chalcopyrite less so, galena and sphalerite rare. Crystallographic measurements of both are given. A. WANDTKE.

The crystal form of polyhalite. R. GÖRGEY. Vienna. *Min. petrog. Mitt.* 33, 48–102(1915).—Polyhalite is found to be triclinic, showing twinning on two faces at an angle of 88° 7.5′, which are taken as (010) and (001). Cleavages at 90° 21.5′ from 010, and on 100 were established; $a:b:c = 0.9314:1:0.8562$, $\alpha = 92° 29'$, $\beta = 123° 4'$, $\gamma = 88° 21'$. Crystals range from tabular forms (010) to columnar and needle-like forms. Thin lamellar twinning on 010 is common; twinning on 100 is also observed. A. D. BROKAW.

Opalescent quartz. ERNST KALKOWSKY. Dresden. *Z. Kryst. Min.* 55, 23–50 (1915).—K. examd. 89 specimens and concludes that opalescent quartz is mainly derived from pegmatitic masses. The causes of opalescence are the same as those of asterism and the phenomena of luminous nodes (cf. Goldschmidt and Brauns, *C. A.* 5, 2383), *i. e.*, ultramicroscopic needles, called *asterites*. K. distinguishes between *epasterism*, due to reflected light, and *diasterism*, due to transmitted light. A. WANDTKE.

Calcite from Diósgyör. A. FRANZENAU. Budapest. *Math. term. Értesitö Mag. Akad. Wiss.* 32(1914); *Z. Kryst. Min.* 54, 570–7(1915).—F. gives a series of crystal forms and measurements obtained from 8 crystals selected from 85 specimens of calcite. A. WANDTKE.

Limestone and its beautiful formations. JAS. B. AITKEN. *Pharm. J.* 95, 272–3 (1915).—An illustrated account of limestone formations in New Zealand. S. WALDBOTT.

The transformation of aluminium silicates under the influence of salt solutions at temperatures up to 200°. HANS SCHNEIDERHÖHN. Berlin. *Neues Jahrb. Min. Geol.* 40 (*Beil. Bd.*), 163–228(1915).—An elaborate compilation of all previous work on this subject. The conclusions which have been drawn from the expts. by many investigators are in most cases not justified, as a true exchange of bases in compds. in the cryst. condition apparently rarely, if ever, takes place. Instead, amorphous compds. are formed, and the replacement goes on in them, although they may form pseudomorphs after the crystals. It is therefore not safe to base inferences as to the constitution of the Al-bearing silicates on such expts. E. T. W.

Aventurine feldspar. OLAF ANDERSEN. Geophys. Lab. *Am. J. Sci.* 40, 351–99 (1915).—Aventurine feldspars (sunstones) should be sharply distinguished from the other group of color-playing feldspars, comprizing moonstones, murchisonites and labradorites. This study embraced 3 groups of examns.: (1) microscopic, (2) detn. of the orientation of the reflecting lamellas, (3) exam. of the properties of the lamellas. The latter were detd. as hematite crystals varying widely in shape and size. The absorption colors are those characteristic of this mineral. The colors in reflected light are

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interference colors of thin films. By means of these colors the thickness of the transparent lamellas was found to vary between 50$\mu\mu$ and 500$\mu\mu$. Pleochroism is absent. Interference spectra in these lamellas are explained as due to their action as polarizers or analyzers for the wedge shaped parts of the feldspar that lie above or below them in the sections. Thermal expts. showed that the lamellas persist up to about 1235°. At this temp. they disappear, presumably by m. together with a small part of the surrounding feldspar to thin, invisible, glass films. The feldspar remains otherwise unchanged. The origin of the hematite lamellas is explained as due to "unmixing" of an originally homogeneous feldspar, which contained Fe oxides in solid soln. A review of previous work, a large number of references, 3 plates, 13 diagrams and 12 tables are given. L. W. RIGGS.

Labradorite. C. GROSSPIETSCH. Prague. *Min. petrog. Mitt.* 33, 27–47(1915). —I. A redetn. of optical properties, crystal angles and sp. gr. of labradorite from Kamenoi Brod, first studied by Schuster in 1881. II. A general discussion of labradorite with tabulated analyses, etc., with special reference to the question of the presence of carnegieite in isomorphous mixt. The scant evidence for assuming this in most cases is found in the comparatively small deviation from the sp. gr. calcd. by Tschermak's law after correction for orthoclase content. A bibliography is appended. A. D. BROKAW.

The formula of aluminous pyroxenes. G. CESARO. *Ann. soc. Belge geol.* 40, 413–21(1913).—It is known that ferruginous pyroxenes always contain Al_2O_3 and that there is too much of the bases for them to be considered as metasilicates. According to Tschermak they result from a combination of a metasilicate, $M = R''SiO_3$, and a hypothetical compd. $T = R_2^{VI}R''SiO_6 = R_2O_3.RO.SiO_2$. Any pyroxene may then be represented by M_mT_1. As there are as many mols. of SiO_2 as of RO in M as well as in T, it follows that analysis should always lead to the mol. relationship $RO:SiO_2 = 1$. The objection to this theory lies in the use of a hypothetical compd. and in the fact that $RO:SiO_2$ is sometimes as high as 1.1. C. thinks the Al_2O_3 is present in pyroxenes as an aluminate, $S = Al_2O_3.RO$ (spinel). By supposing that Al functions in this substance as $(O = Al_2)^{IV}$, a tetravalent radical capable of replacing Si^{IV}, there is complete analogy between the compn. of the metasilicate and that of the aluminate: $R''SiO_3$ and $R''(Al_2O)O_3$. It is also necessary to admit that a part of the sesquioxide is united with metasilicic acid, which is plausible, in view of the fact that in aegirine Fe_2O_3 certainly exists as a metasilicate. A pyroxene, M_nS, corresponds then to the formula $n(SiO_2.aR_2O_3.(1 - 3a)R_2O_3) + Al_2O_3.RO$. If we designate, respectively, by q, p, s the number of mols., given by analysis, of SiO_2, RO, and R_2O_3, respectively, these numbers should be proportional to n, $n(1 - 3a) + 1$, and $na + 1$. In order to det. the two unknowns n and a, there are the two equations: $(na + 1)/n = (s/q)$, $[n(1 - 3a) + 1]/n = (p/q)$, or $n = 4q/(3s + p - q)$, $a = (s + q - p)/4q$, values which det. the formula of pyroxene. For the no. of mols. of RO contained in the metasilicate, $1 - 3a = (q + 3p - 3s)/4q$. The analysis of augite from Vesuvius by Kudernatsch leads to values, $q = 0.848$, $p = 0.858$, $s = 0.052$, which give $n = 20.43$, $a = 0.012$, $1 - 3a = 0.963$, corresponding closely to $M_{11}S_2$, the sesquioxide being thus almost entirely in the state of aluminate. The following analyses of augite from Monte Somma by Doelter lead to the values: yellow augite, $q = 0.840$; $p = 0.823$; $s = 0.066$; $n = 18.56$; $a = 0.025$; $(1 - 3a) = 0.926$; $M_{37}S_2$. Dark green augite, $q = 0.850$; $p = 0.830$; $s = 0.069$; $n = 18.18$; $a = 0.026$; $(1 - 3a) = 0.921$; $M_{18}S_1$. Black augite, $q = 0.782$; $p = 0.797$; $s = 0.123$; $n = 8.15$; $a = 0.035$; $(1 - 3a) = 0.896$; M_8S_1. It is seen that the value of n diminishes, and consequently the proportion of aluminate is increased, with the depth of color. The proportion of sesquioxide contained in the metasilicate varies in the same manner. A difficulty encountered is the fact that the

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formulas lead sometimes to negative values of a, the condition being $s + q > p$, but these are so small that they may be disregarded. The same difficulty presents itself, however, in Tschermak's theory. For example, in the pneumatolytic augite from Vesuvius analyzed by vom Rath: $q = 0.807$; $p = 0.883$; $s = 0.054$, from which are calcd. $n = 13.56$; $a = -0.0068$; $1 - 3a = 1.02$. Supposing the first to be entirely in the state of aluminate, the formula $M_{27}S_2$ corresponds only approximately to the analysis; the calcd. % of Al_2O_3 is 6.2, while the analysis gives 5.6. The formula $M_{16}S_1$ is sufficiently concordant: SiO_2 48.4, Al_2O_3 5.9, FeO 9.3, CaO 22.4, MgO 13.4%, calcd. and SiO_2 48.4, Al_2O_3 5.6, FeO 9.5, CaO 22.9, MgO 13.7% found by analysis. C. discusses further cases in which Tschermak's theory fails to establish formulas for augites. J. H. BOWER.

Arduinite. E. BILLOWS. Venice. *Anal. alcuni min.* 1912; R. KOECHLIN. *Min. petr. Mitt.* 33, 194(1915).—*Arduinite* is described as a red fibrous zeolite with the compn. $H_{16}Na_4CaAl_2Si_8O_{30}$. A. D. BROKAW.

Constitution of zinnwaldite and cryophyllite in the light of the stereo-hexite-pentite theory. W. ASCH AND D. ASCH. *Z. Kryst. Min.* 54, 584–6(1915).—A. and A. show how their theory (*C. A.* 8, 2469) will greatly simplify the formulas of Clarke for these minerals. For zinnwaldite: Clarke, $Al_{344}Fe''_{167}K_{234}Li_{234}H_{116}(AlF_2)_{300}(Si_3O_8)_{288}(SiO_4)_{288}$, and $Al_{288}Fe''_{188}K_{236}Li_{118}H_{108}(AlF_2)_{200}(Si_3O_8)_{151}(SiO_4)_{212}$; A. and A. $Al_{20}Fe''_7K_{10}Li_{10}H_6F_{20}Si_{26}O_{112}$; or as an aluminous silicate $nH_2O_2(5Al_2O_3{-}18SiO_2)$. For cryophyllite: Clarke, $Al_{188}Fe''_{94}K_{236}Li_{234}H_{144}(AlF_2)_{178}(Si_3O_8)_{227}(SiO_4)_{188}$. A. and A. $Al_{88}Fe''_{1.4}K_4Li_8H_8Fe''_{0.4}F_8Si_{11}O_{48.8}$; or as an aluminous silicate $7.5H_2O.3Al_2O_3.15SiO_2$. Structural formulas are also given. A. WANDTKE.

The pholerite from Quenast and the nacrite from Nil-Saint Vincent. A. LEDOUX. *Bull. soc. belge geol.* 27, 96–8(1913); *Neues Jahrb. Min. Geol.* 1915, I, Ref. 183.—The pholerite and nacrite are almost identical in optical properties, being triclinic with low n and birefringence. Pholerite is like kaolinite in compn., but differs in crystn., so must be regarded as distinct. E. T. W.

The dehydration figures of gypsum. R. GRENGG. Vienna. *Z. Kryst. Min.* 55, 1–22(1915); cf. *C. A.* 9, 1586.—This paper deals with the figures obtained on heating gypsum in a vacuum over dehydrating solns. Two degrees of heat, quite low and near 100°, were used, and both the Weiss and Baumhauer figures obtained. Tests show that these figures consist of the half-hydrate, while the "decrepitation" figures appear to be composed of anhydrous $CaSO_4$. The investigation is confined almost entirely to the figures on 010. Review of the literature and many references are given. A. WANDTKE.

Calafatite and almeriite. S. CALDERON. *Min. Espana* 1910, 205–6. R. KOECHLIN. *Min. petr. Mitt.* 33, 194(1915).—*Calafatite* is a white, chalky mineral with H. = 2.5 and sp. gr. 2.75 and the compn. SO_3 34.77, Al_2O_3 37.98, K_2O 9.64, H_2O 17.61%, correspondin to $K_2SO_4.Al(SO_4)_3.5Al(OH)_3.H_2O$. *Almeriite* is the corresponding Na compd. Both occur with gypsum in Almeria. [No reasons for considering these as anything but varieties of alunite are given.—ABSTR.] A. D. BROKAW.

Geology of the ore deposits of the Tintic mining district. GUY W. CRANE. *Bull. Am. Inst. Mining Eng.* 1915, 2147–60.—A detailed discussion of the topography, stratigraphy and ore production of the district, which lies 65 miles south of Salt Lake City. H. L. OLIN.

Pre-Cambrian ore deposits in Ontario. W. G. MILLER AND C. W. KNIGHT. *Mining Sci. Press* 111, 401–4(1915).—Four great metallogenetic epochs of the pre-Cambrian in Ontario are recognized as follows: (1) Grenville-Keewatin, "Fe forma-

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tion." (2) Algoman, Au (Porcupine district) and minor amounts of other metals. (3) Animikean, "Fe formation." (4) Keweenawan, (*a*) Ag-Co-Ni-As deposits at Cobalt and elsewhere, (*b*) Ni-Cu deposits at Sudbury, Cu elsewhere, and minor Au deposits not now productive. "A fifth epoch of importance should probably be added to represent ore-bodies associated with the basic intrusives that preceded the intrusion of the Algoman granites." A. D. BROKAW.

The use of metallographic methods in the microscopic investigation of ores. B. GRANIGG. *Metall u. Erz* 12, 189–200(1915); see *C. A.* 9, 902. C. R. H.

The calamine deposits of upper Silesia. FRIEDRICH RAEFLER. *Metall u. Erz* 12, 283–90(1915). CARLE R. HAYWARD.

The geology of Kalgoorlie. C. O. G. LARCOMBE. *Mining Sci. Press* 111, 238–45(1915).—The carbonaceous slates of Kalgoorlie are developed along shear zones in quartz dolerite, felsite, and calcite-schist. The C is believed to have been derived by the reduction of C oxides that existed in the vein solns. and along shear lines. A. D. BROKAW.

Wabana iron ore of Newfoundland. A. O. HAYES. Canada Dept. of Mines, Geol. Surv., *Mem.* 78, 94 pp.(1915).—The ore is composed of 2 principal iron-bearing minerals, hematite and chamosite; a third, siderite, becomes locally abundant. It is concluded that the iron was derived by long-continued weathering of earlier cryst. and sedimentary rocks, the soln. of their Fe content by mineral and vegetable acids and subsequent transportation of the iron salts by streams into the sea. Some of the Fe was pptd. as hydroxide and was oxidized to hematite by the O liberated by algae during their life action. The siderite was pptd. probably under cover of overlying sediments where concn. of NH_3 and CO_2 resulted from decaying organic matter. Thirty-six plates showing photomicrographic slides of rock sections collected through the different zones are given and described. The conclusions of the petrographic studies are confirmed in nearly every case by chem. analyses. From the results of analyzing a shell of a brachiopod fossil it was decided that the P and original CaO content of the Wabana iron ore have for their source the fossil remains that have been preserved in it. R. L. SIBLEY.

Iron ore in Cass, Marion, Morris and Cherokee Counties, Texas. E. F BURCHARD. U. S. Geol. Survey, *Bull.* 620–E, 69–110(1915).—Geologic description, with chem. analysis of ores (1) residual, unconsolidated deposits of limonite; (2) nodular, "geodal" and concretionary masses of limonite and $FeCO_3$; (3) laminated beds of limonite. These ores may be considered reserve resources whose development would be practical for certain purposes or at certain times. R. C. WELLS.

Iron-bearing deposits in Bossier, Caddo and Webster parishes, Louisiana. E. F. BURCHARD. U. S. Geol. Survey, *Bull.* 620–G, 129–50(1915).—Descriptions of deposits, with analyses. The Fe content of these ores is not high enough to warrant development. R. C. WELLS.

The iron deposits of Daiquiri, Cuba. WALDEMAR LINDGREN AND CLYDE P. ROSS. *Bull. Am. Inst. Mining Eng.* 1915, 2171–90.—The total tonnage production of the mines in this region, the Juragua, the Daiquiri, and the El Cuero, in 1913, exceeded one million. The primary Fe oxide of the deposits at Daiquiri is magnetite which has been altered more or less completely to hematite. As to its genesis, L. and R. incline to the theory of contact-metamorphic action of the magma on an older limestone, by which the latter has become almost entirely displaced by magnetite, derived from magmatic emanations rich in Fe. The ores of Juragua are partly hematized magnetites with gangs of quartz, augite, actinolite, and epidote. The relationship of the magnetite to the augite

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and actinolite suggests a contact-metamorphic origin of the ore. A short bibliography is appended. H. L. OLIN.

Quicksilver deposits of the Mazatzal Range, Arizona. F. L. RANSOME. U. S. Geol. Survey, *Bull.* 620–F, 111–28(1915). R. C. WELLS.

Researches on the salt systems of oceanic salt deposits. J. D'ANS. *Kali* 9, 148–54, 161–8, 177–83, 193–200, 217–22, 229–36(1915).—The literature relating to the ternary and quaternary systems represented by the chlorides and sulfates of Na, K and Mg is brought together and discussed. As an extension of the work of previous investigators, solubility detns. have been made at 0° and 55° and also at a few other points in some of the systems. The new values, representing additional points on the curves, confirm the work of van't Hoff. The data at hand are illustrated and interpreted by copious diagrams, and are used in a discussion of technical methods for the prepn. of Na_2SO_4, K_2SO_4 and $K_2Mg(SO_4)_2.6H_2O$ from mixtures of $MgSO_4$ and NaCl or KCl. W. B. HICKS.

Nephelite syenites of Haliburton County, Ontario. WILBUR G. FOYE. Harvard Univ. *Am. J. Sci.* 40, 413–36(1915); cf. *C. A.* 4, 1446.—The 2 laccoliths of nephelite syenite described in this paper are located in Glamorgan township, Central Ontario. The "Gooderham" laccolith consists of 3 principal rock types: (1) red syenite (umptekite), (2) nephelite syenite (canadite), and (3) nephelite pegmatite, of which petrographic descriptions are given. The "Crescentic" laccolith is discussed under the headings: (1) pyroxene-garnet contact rock, (2) hornblende-nephelite rock, (3) monmouthite, (4) schistose nephelite-biotite rock, and (5) pegmatite-nephelite syenite. Many analyses are quoted, references given, and the geologic and petrographic relations of these minerals are discussed at length. L. W. RIGGS.

The basalts from Luck and Serles, near Buchau, Bohemia. R. FOLGNER AND E. KITTL. Leoben. *Neues Jahrb. Min. Geol.* 1915, I, 127–42(1915).—An olivine-basalt and a feldspar-basalt are described petrographically, an analysis of each, with the Osann classifications, being given. E. T. W.

The basalts of the southwestern extension of the Vogelsberg to the right of the main line. HANS PFISTERER. *Neues Jahrb. Min. Geol.* 40(*Beil. Bd.*), 1–50(1915). —The rocks are described geologically and petrographically in great detail, 5 analyses and their positions in the Osann classification being given. E. T. W.

Analcite basalt. A. PELIKAN. Prague. *Min. petrog. Mitt.* 33, 187–93(1915). —P. suggests that analcite may belong to the "epimagmatic" period of Becke, to which also the calcite of certain granites may belong, rather than being a primary consituent of the rock. A. D. BROKAW.

New and little known rocks from the vicinity of Bruck a/M. JOSEF STINY. Bruck. *Neues Jahrb. Min. Geol.* 1915, I, 91–111.—The rocks of this region are described as to occurrence and petrography, analyses of a variety of wehrlite and of both carbonate and silicate portions of a limestone with silicate-mineral inclusions being given. E. T. W.

Metamorphism of salts and silicate rocks. F. RINNE. Leipzig. *Ber. K. Sächs. Ges. Wiss.* 66, 118–35(1915).—A general article, discussing the problems of metamorphism as affected by temp., pressure, and the presence of H_2O, and comparing silicate rocks with salt mixts. such as those studied by van't Hoff. GEO. W. MOREY.

Geology of the Victoria and Saanich map-areas, Vancouver Island, B. C. C. H. CLAPP. Canada Dept. Mines, *Geol. Survey Mem.* 36, 140 pp.(1915).—Chiefly geological in character. A description of the various rocks found in the area investigated is given. A peculiar iddingsite is described, which is apparently a pseudomorph after olivine. This iddingsite does not appear to be uniform in comp. Near their

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centers the grains are colorless with a low birefringence but with the other optical and crystallographic characters of iddingsite. Near the periphery of the grains and along cleavage cracks are flakes of a typical, bright, brownish red iddingsite with a strong pleochroism and high birefringence, having the same orientation as the colorless centers. It is concluded that the center is a serpentine (possibly antigorite), which strengthens the conclusion that iddingsite is a lamellar serpentine colored by red Fe oxides. A gneiss is described containing a large amt. of quartz, as well as much FeO, MgO and CaO, and but little K_2O, an abnormal make-up, represented by but two similar norms in Washington's tables. R. L. SIBLEY.

A geological reconnaissance between Golden and Kamloops, B. C. R. A. DALY. Canada Dept. of Mines, *Geol. Survey Mem.* **68**, 158 pp.(1915).—A geological report on an area of 1400 sq. mi. is given. A quartz from pegmatites was found to be bluish and iridescent owing to a strongly cataclastic structure in the crystals. The Ordovician limestone is assumed to have been formed by pptn. of the carbonate particles from sea water at ordinary temp. by $(NH_4)_2CO_3$ which has been bacterially generated from animal matter. Cf. *C. A.* **9**, 2050. R. L. SIBLEY.

Symposium on the earth: its figure, dimensions and the constitution of its interior. I. The interior of the earth from the viewpoint of geology. T. C. CHAMBERLIN. **II. Constitution of the interior of the earth as indicated by seismological investigations.** H. F. REID. **III. The earth from the geophysical standpoint.** J. F. HAYFORD. *Proc. Am. Phil. Soc.* **54**, 279–308(1915). L. W. RIGGS.

Topical parameters in the light of the stereo-hexite-pentite theory (ASCH) **2**. Crystal structure (SCHOENFLIES) **2**. Determination of combustible gases in mineral waters (HAUSER) **1**.

SPENCER, M. L. J.: **The Numerical Data of Crystallography and Mineralogy.** Chicago: Univ. of Chicago Press. 19 pp. 4 fr.

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9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Report of W. Menzel's studies regarding the smelting of the so-called mixed ores, copper, lead and zinc bearing sulfide ores. W. BORCHERS. *Metall u. Erz* **12**, 266–8 (1915).—The outline of the process is as follows: (1) Roast the ore sufficiently to produce a mat not too rich in Cu but rich enough for direct conversion to blister Cu. (2) Smelt in an elec. furnace, recovering the Cu as mat and volatilizing the Pb and Zn. (3) Work up the mat in a reverberatory or converter and refine electrolytically. (4) Leach the Zn from the flue dust. (5) Electrolyze the Zn solution. (6) Smelt the residue from the Zn leaching for Pb. CARLE R. HAYWARD.

Chemical principles of the blast furnace. J. E. JOHNSON, JR. *Met. Chem. Eng.* **13**, 536–43, 634–8(1915).—J. emphasizes the distinction between the functions of shaft and bosh, that of the first being to produce an Fe sponge and of the second to melt the sponge to liquid Fe and slag. The theory of the momentary formation of CO_2 at the tuyères and its endothermic conversion to CO as it passes upward is confirmed by the fact of the existence of a zone of max. temp. at the inlet. He reviews at length the work of Baur and Glaessner on the equilibria between the oxides of C and Fe (cf. *Z. physik. Chem.* **43**, 361(1903); *Stahl u. Eisen* **23**, 556(1903)) but points out that the compn. of the top gas does not depend, primarily, upon the reactions described. A definite amt. of C is burned to CO in the hearth and this takes up a definite amt. of

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O_2 from the ore, but a disturbing factor is the variable amt. of C dissolved in the gases before it reaches the tuyères. The conditions controlling the carburization of cast Fe are little understood and much work remains to be done in the field. S is introduced with the coke which contains from 0.6 to 2% in the form of FeS_2 and FeS. With other impurities it is eliminated as CaS in the slag. Fe exerts a solvent influence upon Si, P and Mn, and also probably forms definite compds. with them. They are reduced, probably by solid C only and not by CO. Ti causes trouble by forming an infusible cyano-nitride which collects in the hearth. The rare ores with excess of CaO are fluxed by addition of ore high in SiO_2. Cyanides and CaC_2 occur in the furnace but their formation has been little studied. "The chemistry of the blast furnace is not a chemistry of definite atomic proportions but a chemistry of infinitely varying balances among conflicting tendencies." H. L. Olin.

Desulfurization in cupola practice. O. Vollenbruck. *Iron Age* 96, 468–9 (1915).—The paper summarizes the results obtained in desulfurization by absorption by CaO and various Mn and Ca silicates; by varying wind pressures; by smelting with C; by the effect of oxidizing flame. D. B.

A converter foundry of large capacity. E. F. Cone. *Iron Age* 96, 669–74(1915). D. B.

Experiments with blast stoves. Peter Pappe and Otto Johannsen. *Stahl u. Eisen* 35, 753–7(1915). Carle R. Hayward.

Open hearth furnace heating. Hugo Krueger. *Stahl u. Eisen* 38, 697–706 (1915).—Numerous tables are given showing the decompn. of different gases during preheating and the consequent lowering of calorific power. There is also a tabulated comparison of the heat produced by preheating air and gas to different temps. Carle R. Hayward.

Copper extraction from burnt pyrite in Pernau. W. Borchers. *Metall u. Erz* 12, 379–93(1915).—A descriptive article with illustrations of methods, for chloridizing and leaching the ore. Carle R. Hayward.

Notes on pyritic smelting. R. Stören. *Metall u. Erz* 12, 200–6, 220–6, 241–50 (1915).—A general, descriptive paper. Carle R. Hayward.

Simple cyanide-plant design. S. A. Worcester. *Eng. Mining J.* 100, 631–3 (1915).—An important feature in the operation of the plant described is the elimination at the dump grizzly of the course low-grade material, thus avoiding a source of loss common in the district, *viz.*, milling 50 c. ore at $1.00 costs. Numerous automatic devices have been installed to save labor, *e. g.*, short conveyors for removing tailings delivering to a long pivoted bridge conveyor. H. L. Olin.

Ferrous and ferric iron in cyaniding. Will H. Coghil. *Mining Sci. Press* 111, 598(1915).—Tailings containing 0.045 and 0.172% sol. Fe^{++} and Fe^{+++}, after being crushed on the bucking board were found to have developed prohibitive amts. of cyanicides. After 15 times through a disk pulverizer the Fe^{++} content was 0.213%. C. concludes that Fe^{+++} salts were reduced to Fe^{++} by Fe and that laboratory samples of this kind of ore should be ground in porcelain with flint unless the natural acidity is first neutralized. H. L. Olin.

The bad influence of sulfide and sulfate sulfur on the reduction of roasted blende. V. Lindt. *Metall. u. Erz* 12, 335–47(1915).—The influence of the sulfide S on the reduction of roasted blende with low sulfate content (2–3% S) is bad when the ratio of Zn to sulfate S is less than 10:1. When the ratio is higher the influence is not bad but good, being most favorable between the ratios 18:1 and 16:1. The influence of sulfate S on the reduction of roasted blende with low sulfide S content (1–2%) is bad when the ratio of Zn to sulfate S is less than 4:1. When the ratio is higher the influence is not

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bad but good, being most favorable at the ratio 5:1. The influence of S when both sulfide and sulfate are high is bad when the ratio of Zn to sulfide S is less than 20:1 or to sulfate S less than 5:1. At higher ratios the influence is somewhat favorable, reaching a max. when the Zn ratio to sulfide S is 27:1 or to sulfate S 6:1. An increase in sulfide S is more detrimental than an increase in sulfate S. Roasted blende in which the sulfide S is united only with Fe and which contains no Pb or blendes which are very low in Fe or contain Fe only as Zn ferrites show greater Zn losses than normal blendes. Blendes containing much lime must be roasted sufficiently to reduce the sulfide S to a very low figure. CARLE R. HAYWARD.

The requirements in raw material, technic and costs in the metallurgical production of cadmium. FRANZ JURETZKA. *Metall u. Erz* 12, 235–41(1915).—The principal sources of Cd are blende and calamine, where it exists as CdS and $CdCO_3$, resp. A large part of the Cd in ores is lost during sintering or roasting. Cd may be recovered from solns. by pptg. with H_2S and giving the ppt. a weak roast. Most of the Cd on the market is obtained from Zn dust, obtained in the first $1^1/_2$–2 hrs. of Zn distn. This may be leached with HCl or re-treated in a special retort which produces a rich Zn-Cd dust. This is once more retorted in an iron retort for the recovery of metallic Cd. Care must be taken to keep the temp. low to prevent the distn. of Zn. Cd is used for easily fusible alloys and dental amalgams. A tabulated statement of costs is given at the close of the paper. CARLE R. HAYWARD.

The working up of mercury-bearing by-products in zinc plants. FRANZ JURETZKA. *Metall u. Erz* 12, 307–10(1915).—In roasting Hg-bearing blendes the Hg is volatilized and condenses partly in the Glovers towers, partly in the acid chambers and partly in the flue dust. The flue dust may be heated and the Hg recovered. The acid slime from the towers and chambers is neutralized with CaO and the Hg distd. from the product. CARLE R. HAYWARD.

Wright concentrating table. C. W. WRIGHT. *Eng. Mining J.* 100, 641–3(1915). —A detailed description of an improved table designed for use in Sardinian Pb-Zn mills. H. L. OLIN.

Flotation testing machine. R. W. SMITH. *Eng. Mining J.* 100, 395(1915).—A description with drawings of a simple machine which could be improvized in almost any plant. Special points are flexibility, so that tests may be made under a wide variety of conditions; duplications of the proportions of commercial machines, so that the results may be directly transferred to large scale operations; and provision for a quiet compartment in which the froth rizes, so that accurate detns. of quantity and value of concentrates may be made free from disturbances due to the agitator.
W. L. BADGER.

Concentrating Gold King ores. W. C. PROSSER. *Eng. Mining J.* 100, 633–4 (1915).—At the Gold King mill standard table concn. is followed by an application of the flotation process. The ore carries Pb, Zn and much pyrite in addition to the Au. E. J. C.

Separation of white metal and gunmetal borings. R. H. WALTON AND G. T. BAILEY. *J. Soc. Chem. Ind.* 34, 943–5(1915); see *C. A.* 9, 1450. E. H.

Reclamation of magnalium from turnings. J. COULSON. *Trans. Am. Inst. Metals* (advance copy) 8, 7 pp.(1915).—Exptl. melts of magnalium (5–10% Mg, 90–95% Al) turnings in an air-tight shell heated in an elec. furnace, under a current of H gave about 90% recovery. Boiling in 4% NaCl soln., and melting as above with the app. modified so that the metal ran out as melted through holes in the bottom of the crucible, gave 8% loss. Washing in benzine, then boiling in 4% NaCl, placing the damp turnings in an open crucible and puddling continually, gave 4% loss. By puddling

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without previous treatment, the loss was 6%. The last method is used on a commercial scale. 1% metallic Ca or 0.5% CaAl silicide added to the remelted turnings restores them to their original physical condition as shown by tensile test, elongation, etc. No other tests are cited to show whether the presence of Ca is disadvantageous. H. W. GILLETT.

The impurities of metallurgical chamber acid. A. HOFFMANN. *Metall u. Erz* **12**, 290–7, 310–18(1915).—The SO_2 from ZnS burners contains chimney dust which, to some extent, contaminates the H_2SO_4 obtained as a by-product and causes choking of towers and pipes. In studying the chem. compn. of some of the crusts and slimes, several acid sulfates were found which have not been mentioned in the literature as likely to occur. Such compds. are $Fe_2(SO_4)_3.3H_2SO_4.8H_2O$ which is extremely hygroscopic, $FeH_3(SO_4)_2.7H_2O$ and $AlH(SO_4)_2.H_2O$. Similarly in concentrating the chamber acid, $Fe_2(SO_4)_3.S_2O_7$ and $ZnSO_4.3H_2SO_4$ were deposited; the acid ferric pyrosulfate was remarkably insoluble. W. T. H.

Metastability of metals. A. VOSMAER. *Met. Chem. Eng.* **13**, 535–6(1915).—A review of E. Cohen's work. D. B.

Metallography. B. R. BAKKER. Univ. Utrecht. *Dental Cosmos* **57**, 673–84 (1915).—A description of the principles and app. used in the physico-chem. study of metals and alloys. JOSEPH S. HEPBURN.

Physical properties of copper. C. R. HAYWARD. Mass. Inst. Tech. *Trans. Intern. Eng. Congress* **1915** (advance copy), 24 pp.—A review of the electrical and mechanical properties of Cu, and the effect of impurities, with photomicrographs and cooling curves. D. B.

The metallography of copper. W. CAMPBELL. Columbia Univ. *Trans. Intern. Eng. Congress* **1915** (advance copy), 16 pp.—A review of the metallography of Cu, the effect of impurities and of hot and cold working, with photomicrographs. D. B.

The recent progress and present state of the technical application of the case hardening of steel. F. GIOLITTI. Genoa, Italy. *Trans. Intern. Eng. Congress* **1915** (advance copy), 50 pp.—The paper constitutes a small text-book on case-hardening. The subjects considered are: (1) the present theoretical knowledge concerning the case-hardening of steel; (2) characteristics of the various carburizing substances and their use; (3) technical conditions for the use of carburizers; (4) treatment and characteristic properties of cemented parts. D. B.

Manganese steel and the allotropic theory. ALBERT SAUVEUR. *Bull. Am. Inst. Mining Eng.* **1915**, 787–90; cf. *C. A.* **8**, 3771.—In the discussion of the paper, G. K. Burgess doubted whether the expts. cited threw any light on the subject of allotropy particularly as regards the existence of β-Fe. J. E. Stead did not agree that the hardness of quenched and reheated steel is due to the presence of β-Fe. W. T. HALL.

The surface decarbonization of tool steel. J. V. EMMONS. *Bull. Am. Inst. Mining Eng.* **1915**, 790–4; cf. *C. A.* **8**, 3770.—In the discussion A. Sauveur questioned whether CO_2 is as good a decarbonizing agent as pure O. O. W. Storey pointed out that in prepg. commercial malleable-Fe the method of packing the material and the compn. of the gases in the annealing furnace are the important factors to consider in prepg. material whose surface is pure ferrite. The results obtained by E. are applicable to the making of malleable Fe. H. O. Hofman pointed out that Fe_2O_3 is not decompd. by heat alone at temps. below 1300°. W. T. H.

Finishing temperature and properties of rails. G. K. BURGESS, *et al. Bull. Am. Inst. Mining Eng.* **1915**, 767–87; cf. *C. A.* **8**, 3285.—In the discussion, in which A. Sauveur, W. R. Webster, P. H. Dudley, G. B. Waterhouse, M. H. Wickhorst, James

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Aston, E. F. Kenney, A. W. Gibbs, W. A. Aiken and G. K. Burgess took part, considerable divergence of opinion was expressed. The influence of a severe winter on the number of broken rails was pointed out and also the effect of segregation of C and P. The need of more expts. was noted. W. T. HALL.

Heat treatment of case-hardened carbon steel. ANON. Am. Soc. Testing Materials, *Yearbook* 1914, 207–8.—Methods of heat treatment after carburization to obtain hardness, toughness, etc., of both case and core. D. B.

The control of chill in cast iron. G. M. THRASHER. *Bull. Am. Inst. Min. Eng.* 1915, 2129–38; see *C. A.* 9, 433. D. B.

Hardening and tempering high-speed tool-steel. C. A. EDWARDS AND H. KIKKAWA. Manchester, Eng. *Engineering* 100, 349–52(1915).—The first effect of tempering hardened high-speed steels is to make them softer; at higher temp. they then become harder. After heating at about 614° they are much harder than in the initial air-quenched state. Cr in conjunction with C is the cause of great hardness, and also lowers the temp. at which these steels can be air-hardened. In the absence of Cr, W raises the temp. at which tempering begins; in the presence of Cr it increases the intensity of secondary hardening, and it raises the tempering temp. W steel containing 18% W and 0.63% C can be air-hardened only by rapid air-quenching from temps. above 1050°. When high-speed steels are hardened at low temp. the tempering properties approx. those of pure Cr steel. This is due to the inactivity of undissolved W. For the max. resistance to tempering and max. secondary hardening the W must be dissolved. This requires a temp. of 1350°. On tempering, an increase of hardness is accompanied by an increase in vol. DONALD BELCHER.

Carburization of iron in blast-furnace gases. T. H. BYROM. *Engineering* 100, 352–3(1915).—A soft-steel sheet which had been exposed for several yrs. to furnace gas at a temp. not exceeding 500° was removed and found to be very brittle in the central portion. A chem. analysis of this brittle portion showed that the steel had been converted into Fe_3C. Test specimens were exposed to the gases, and from the results it was concluded that the carburization was due to CO, and that the action became slower the more CO_2 present and the lower the temp. A deposit of FeS was also observed. DONALD BELCHER.

Decarburization in heat-treated steels. J. G. AYERS, JR. *Iron Age* 96, 5–7 (1915).—The investigation was undertaken to det. the extent of decarburization of steels caused by heat treatment. Owing to the difficulty in prepg. samples for the chem. analysis of successive layers the microscope was chosen. Unfortunately, it is necessary to subject the steel to a further heat treatment that will impart a structure in which the pearlite may be resolved readily from the other constituents, and this treatment may itself produce carburization. Therefore all specimens were normalized in an atm. of N. The constituents at any section may be estimated by the areas they cover. It was evident from the examn. that surface decarburization frequently takes place, due either to the mill practice or to the heat treatment. D. B.

Standard specifications for methods of chemical analysis for plain carbon steel. ANON. Am. Soc. Testing Materials, *Yearbook* 1914, 169–76, 181–92.—For the C detn. Cain's method is recommended. Cf. *C. A.* 8, 2859. D. B.

Standard specifications for manganese bronze ingots for sand castings. ANON. Am. Soc. Testing Materials, *Yearbook* 1914, 288–9.—The chem. compn. shall be as follows: Cu 53–62, Zn 36–45, Al 0.05 to 0.5, Pb not over 0.15%. Mechanical specifications are also given. D. B.

Standard specifications for spelter. ANON. Am. Soc. Testing Materials, *Yearbook* 1914, 284–7.—High grade spelter shall not contain over 0.07% Pb, 0.03% Fe,

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0.05 Cd. It shall be free from Al. The sum of Pb, Fe and Cd shall not exceed 0.10%. Intermediate spelter shall not contain over 0.20% Pb, 0.03% Fe, 0.50 Cd, and no Al. Pb, Fe, Cd not to total over 0.50%. Brass special spelter shall not contain over 0.75% Pb, 0.04% Fe, 0.75% Cd, and no Al. Pb, Fe, Cd not to exceed 1.20%. Prime western spelter shall not contain over 1.50% Pb, 0.08% Fe. Details of analysis and sampling are given. D. B.

Standard specifications for foundry pig iron. ANON. Am. Soc. Testing Materials, *Yearbook* 1914, 225–7. D. B.

Standard specifications for locomotive cylinders. ANON. Am. Soc. Testing Materials, *Yearbook* 1914, 238–41.—The cast Fe shall not contain over 0.90% P nor over 0.12% S. D. B.

Standard specifications for cast iron car wheels. Am. Soc. Testing Materials, *Yearbook* 1914, 242–7.—The following analysis represents the chem. properties of a good cast-Fe wheel, though satisfactory wheels may differ considerably in some constituents: Total C 3.50, graphitic C 2.90, combined C 0.60, Si 0.70, Mn 0.40, P 0.50, S 0.08%. D. B.

Standard methods for metallographic tests of metals. Am. Soc. Testing Materials, *Yearbook* 1914, 364–6.—Directions for etching, microscopic and macroscopic examn. D. B.

Specifications for United Steel Products Co. for standard steel rails. Am. Soc. Testing Materials, *Yearbook* 1914, 390–403.—Chem. and physical requirements, details of manuf., etc. D. B.

Metallic crystal twinning by direct mechanical strain. C. A. EDWARDS. Manchester Univ. *J. Inst. Metals* (advance copy) 12, 16 pp.(1915).—When a metal, such as Zn or Sn, is strained, a previously plane-polished surface will show small "steps" under the microscope. These are commonly called slipbands and are supposed to show that plastic deformation takes place by a process of slip along cleavage planes. Twinned crystals give the same appearance under the microscope, in both cases the light portions appearing dark, and *vice versa*, on rotating the sample 180°. But by polishing smooth and etching again, the "steps" would be eliminated, and the light portions would stay light on rotation, while the differently oriented twinned crystals would still show the change from light to dark. Photomicrographs of tin are shown which indicate that the phenomenon is due to twinning rather than to slipping. The twinning is greater the lower the temp. at which the specimen is strained, so the twin crystals are not formed by annealing. Hardening by cold working (breaking up large crystals) is explained by 2 theories: (1) Slipping along cleavage planes has crushed parts of the crystals and thus formed amorphous material; (2) crystal twinning has taken place with absorption of energy, giving an increased solution pressure at the surface of the twinned crystals. The latter theory does not assume the formation of amorphous material, but E. shows by diagrams that in twinning the rotation of cryst. matter must be great enough to cause sufficient distortion to form as much amorphous material as would be expected by the slipband theory. H. W. GILLETT.

Tensile properties and molecular homology of metals at higher temperatures. P. LUDWIK. *Z. Ver. deut. Ing.* 59, 657–64(1915); cf. *C. A.* 8, 2836.—Tension tests are made on Al, Pb, Cd, Fe, steel, Cu, Mg, Ni, brass, Zn, and Sn at temps. from 20° to those close to their m. ps. The methods of conducting tests and the results are given in detail, and allotropic changes discussed. From the results the idea of molecular homology was drawn, whereby homologous states are indicated as molecular states at abs. temps. which stand in like relation to the abs. melting temps. This theory makes it possible to explain the effect of velocity of change of form on the hardness

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and strength and the action of annealing and temp. at once. Relations between the mol. homology, thermal coeff. of expansion and heat capacity are explained, and from these simple relations between the melting temps. and the modulus of elasticity are drawn and the known variations of many elements (especially C) from Dulong-Petit's law explained. Finally, the effect of at. vol. on hardness and strength are critically examd. The change of ductility with temp. varied considerably in the metals examd. The ductility of Al and Mn increased with uniform rise of temp., while brass became more brittle; on the other hand, Fe, Zn and Sn varied, first tough and then brittle. With reference to change of strength the metals examd. fall into 2 groups; the pure metals, excepting Fe and Ni, show a somewhat steady decrease of strength with increasing temps., while Fe and Ni show prominent irregularities within certain temp. limits. H. R. GUNDLACH.

Radiography of metals. W. P. DAVEY. *Trans. Am. Electrochem. Soc.* (advance copy)(1915).—A résumé of work previously published. (Cf. *C. A.* **9**, 2756.) W. E. RUDER.

The physical properties of metals as functions of each other. A. H. STUART. *J. Inst. Metals* (adv. copy) **12**, 10 pp.(1915).—Math. discussion of the law of Dulong and Petit, on which S. considers 6.25 a better const. than 6.4. The modulus of elasticity (E) in kg. per sq. mm. of several metals is shown (only approximately) to satisfy the equation $E = 0.225\ D \times S/L$, where D = density, S = sp. heat and L = coeff. of linear expansion (calories required to expand 1 g. metal, in form of a rod, to twice its original length). H. W. GILLETT.

Recent developments in aluminium. ERNEST V. PANNELL. *Trans. Am. Inst. Metals* (advance copy) **8**, 22 pp.(1915).—The conductance per lb. of Al is about twice that of Cu. Its tensile strength is about 0.5 that of Cu; hence Al cables reinforced with steel are extensively used. Al alloys gradually deteriorate. For all elec. purposes 1 lb. of Al is equiv. to 2 lbs. Cu. In discussing the paper PAUL M. LINCOLN noted that, whereas the sag of Al lines caused by the high coeff. of expansion once was a serious difficulty, this has been obviated by the steel core. Another advantage of Al is that its large diam. per conductance decreases the tendency toward corona and is therefore useful in high tension work. C. B. AUEL discusses at length the welding of Al. DONALD BELCHER.

Investigation of bearing metals: lead-antimony-tin alloys. O. BAUER. *Stahl u. Eisen* **35**, 445–50, 553–8(1915).—There are 3 general classes of these alloys: (1) Rich in Pb, poor in Sn. (2) Medium in Sn. (3) Rich in tin. The latter are expensive. The alloys with less than 25% Sb tend to liquate during slow cooling causing the crystals of Pb-Sb compd. to float. The best results are obtained by chilling which lessens liquation. It is difficult to prevent liquation in large castings. The tendency to liquate is lessened by adding Cu. The hardness of the alloys reaches a max. with 30% Sn, 60% Sb and 10% Pb. The hardness of each binary alloy of the series is increased by the addition of the 3rd metal. When the chilled alloys are annealed at 150° the hardness of the Sn-rich alloys is increased and that of the Sn-poor alloys is diminished. While in general the brittleness increases with the hardness, the Sn-rich alloys with less than 25% Sb show no tendency toward brittleness. These alloys stood up well under pressure tests. The micro-structure of the alloys to which Cu has been added shows Cu-rich needles; otherwise it is unchanged. The addition of Cu increases the hardness and brittleness but in the quickly cooled alloys the hardness is increased and the brittleness decreased. CARLE R. HAYWARD.

The influence of tungsten on nickel. R. IRMANN. *Metal. u. Erz* **12**, 358–64 (1915).—The alloys examd. contained from 2.6 to 47.4% W. The series up to this point showed 2 compds., one at Ni_4W and the other undetd. The effect of 63% H_2SO_4

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soln. was studied. With increasing W the solubility decreased up to 18% W, then increased slightly up to 25%, after which it decreased to practically zero. The addition of W increased the elec. resistance. Brinell hardness tests showed a decrease to 18% W, then a rapid increase. The tensile strength decreased up to 23% W then increased.
CARLE R. HAYWARD.

Transformations in the alloys of gold with copper. N. KURNAKOV, S. ZHEMCHUZHNUI AND M. ZASYEDATELEV. *J. Russ. Phys. Chem. Soc.* 47, 871–97(1915).—The introduction of more refined methods made it advisable to reëxam. the alloy Au-Cu with respect to its cooling curve, microstructure, hardness and elec. cond. The samples were either heated and quickly cooled or tempered. The results show that at ordinary temp. the alloy may contain 3 phases, the α-phase which is an isomorphous mixt. with 65–100 at. % of Au, and the compds. Cu_3Au and CuAu which form solid solns. with an excess of the components. The formation of these compds. begins at the transition p. 367.3° and 370.8°. At high temps. they decompose, the alloy then containing only the α-phase. While the latter is soft and plastic, the compd. CuAu is extremely hard and brittle. Numerous tables, curves and etch figures illustrate the article.
H. M. GORDIN.

Melting aluminum chips. H. W. GILLETT. Bur. of Mines. *Trans. Am. Inst. Metals* (advance copy) 8, 8 pp.(1915)—In melting down Al chips as brass chips would be handled, the loss is 30 to 50% because many tiny globules of metal are surrounded by a film of Al_2O_3 and dirt which prevents them from coalescing. This film must be broken through mechanically, as by constant puddling with the borings just at the m. p., or by the use of a flux to dissolve the Al_2O_3 and dirt. A suitable flux is 85% NaCl, 15% CaF_2, of which 20 to 50% of the wt. of the chips is used and intimately mixed with them before charging. Absolutely clean borings give much higher recoveries than dirty borings. The use of the NaCl-CaF_2 flux gives better results on dirty borings than puddling. Care in keeping borings absolutely clean in the machine shop is worth while. It is possible that dirty borings may be cleaned by washing in dil. NaOH soln. and dried by centrifuging.
H. W. GILLETT.

Stellite. ELWOOD HAYNES. *Trans. Am. Inst. Metals* (advance copy) 8, 4 pp. (1915); cf. *C. A.* 9, 1892.—The paper concerns itself with stellite alloys containing W or Mo. They are very hard and some are very brittle; in order to det. the breaking stress when used as a $^3/_8$" sq. tool, a holder was made and vertical pressure was applied 1" from the clamp. Bars which could stand a pressure of 1200–1500 lbs. were obtained. The value of the stellite tool lies in its ability to hold the cutting edge at high temps.
DONALD BELCHER.

The manufacture and use of alumino-vanadium. W. W. CLARK. *Trans. Am. Inst. Metals* (advance copy) 8, 8 pp.(1915).—The investigation proposed to carry the use of V, already advantageous in the metallurgy of steel for its effect in causing resistance to fatigue, increased elongation and perfect homogeneity, into the non-ferrous field. Cu-V was rejected because of the cost of manuf., low vanadium efficiency, and its relative insolubility in brass and bronze. Al-V, made by the thermite process, is reasonably cheap and sol. in brass and bronze. The V increased the elongation of Al. Ni-V and Mn-V are as easily made.
DONALD BELCHER.

The development of an acid-resisting alloy. S. W. PARR. Univ. Illinois. *Trans. Am. Inst. Metals* (advance copy) 8, 7 pp.(1915); illus.—In attempts to find an alloy, inexpensive yet resistant to corrosion and possessing working properties, an alloy has been obtained containing 6.42 Cu, 0.98 Mn, 1.04 Si, 2.13 W, 60.65 Ni, 1.09 Al, 0.76 Fe, 21.07 Cr, 4.67% Mo. The alloy is highly resistant to HNO_3 and H_2SO_4; it is difficult to cast but turns well. Its tensile strength is approx. 50,000 lbs.

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per sq. in. The development of the alloy was largely along empirical lines, although it was attempted to distribute the elements in such a way as to promote no elec. potential. DONALD BELCHER.

An acid-resisting alloy to replace platinum in the construction of a bomb calorimeter. S. W. PARR. *J. Am. Chem. Soc.* 37, 2515–22(1915); see preceding abstr. E. B. MILLARD.

The alloys of chromium, copper, and nickel. DAVID F. MCFARLAND AND OSCAR E. HARDER. *Trans. Am. Inst. Metals* (advance copy) 8, 15 pp.(1915).—Cr-Cu-Ni alloys of commercial value are limited to well defined ranges of compn. In the Ni-rich corner of the triangular equil. diagram the alloys have large crystals, coarse texture, and develop blow holes when cast. The alloys rich in Cr have high m. p. and are difficult to prepare. Those containing much Cu with Cr show such marked segregation that they do not machine well. The alloys in the restricted region show good resistance to solvents in addition to their mechanical properties. D. BELCHER.

Aluminium bronze alloys. W. M. CORSE. *Trans. Am. Inst. Metals* (advance copy), 8, 11 pp.(1915); illus.—With Al above 7% the hardness of the alloys can be varied greatly by different heat treatment and the addition of other elements. Al bronzes appear to be superior to Mn bronzes with regard to fatigue, and resistances above the elastic light. The increased hardness opens a new field for the bronzes. D. B.

The manufacture and uses of wrought manganese bronze. JESSE L. JONES. *Trans. Am. Inst. Metals* (advance copy) 8, 11 pp.(1915).—A representative Mn bronze contains: Cu 57, Fe 1.4, Pb 0.03, Mn 0.02, Sn 1.20, Zn 40%. The Cu should be as pure as possible; the importance of pure Zn is great. It may be obtained sufficiently pure from willemite or by double distn. of dross. Details of melting, pouring, and forging are given. D. B.

Titan bronze. ANON. *Met. Chem. Eng.* 13, 645–6(1915). D. B.

Microstructural changes accompanying the annealing of bronze. H. S. RAWDON. *J. Wash. Acad. Sci.* 5, 589–91(1915).—After casting, the alloy presents a complex structure consisting of a dendritic matrix of a solid soln. of Sn (and Zn) in Cu; in it are imbedded numerous particles of an eutectoid. When annealed, the alloy is first made homogeneous by the absorption of the eutectoid by the matrix, and the disappearance of the dendritic structure by diffusion. If the alloy has not been deformed before annealing, no other changes are observed. The characteristic polyhedral twinned crystals seen in annealed brass and bronze rich in Cu are obtained only after distortion. A striking fact is that although the crystals in the layer of recrystallized metal increase in size upon annealing there is no appreciable increase in the thickness of the layer itself. DONALD BELCHER.

Structural changes in industrial brasses. D. MENEGHINI. Univ. Padua. *J. Inst. Metals* 1915 (advance copy), 8 pp.; cf *C. A.* 9, 434. H. W. GILLETT.

Copper alloys with notes on brass founding. H. L. REASON. *Metal Ind.* 13, 318–21(1915).—The paper gives various data on brasses and bronzes. D. B.

Boronized cast copper. E. WEINTRAUB. *Trans. Intern. Eng. Congress* 1915 (advance copy), 4 pp.—Boroflux is a material which contains B in a state of oxidation below that of B_2O_3; its function is to de-oxidize Cu. It is generally assumed that O hardens Cu; therefore, since boronized Cu is hard enough to machine, the probability is that a sufficient amt. of O is left to harden the metal. DONALD BELCHER.

Notes on the copper-rich kalchoids (copper-tin-zinc alloys). SAMUEL L. HOYT. *Trans. Am. Inst. Metals* (advance copy) 8, 12 pp.(1915); cf. *C. A.* 8, 484, 3413. DONALD BELCHER.

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Notes on the copper-rich kalchoids. S. L. HOYT AND P. H. M. P. BRINTON. *J. Inst. Metals* 1915 (adv. copy), 11 pp.; cf. preceding abstr. H. W. GILLETT.

The hardness of copper-zinc alloys. D. MENEGHINI. Univ. Padua. *J. Inst. Metals* (advance copy), 12, 6 pp.(1915); cf. *C. A.* 9, 1453.—A small hardness-testing machine, made on the Brinell principle but using a ball of only 2.9 mm. diam. with a pressure of 10870 kg., exerted by a wt. on a lever, was built and hardness detns. made on 29 annealed Cu-Zn alloys, which check well with Brinell detns. Data, curves and photomicrographs of the impressions are given. H. W. GILLETT.

Report of the tests of metals and other materials, made at Watertown arsenal during 1914. ANON. U. S. War Dept., *Document* 477, 217 pp.; illus.—To det. the effect of streaks in shrapnel cases made from bar stock, the cases were subjected to hydraulic pressure until fracture occurred. The tests showed that streaks are an indication of weakness and that cases made from forgings are stronger than those made from bar stock. Tests were carried out to det. the resistance of several types of rotating bands on projectiles and it was found that the resistance of the band increases with the width and with the amt. of cold working; Cu deposited on the lands and grooves of the gun increases the resistance materially but lubrication has no apparent effect. The examn. of a breach bushing from a 14-in. gun which cracked in service indicated that the metal was defective owing to improper heat treatment, the presence of slag and local segregation. Charpy impact tests were made on steel axels and crank pins from locomotives and it was found that specimens taken normal to the direction of forging give lower values than those taken along the direction of forging and that longitudinal sections are much more uniform than those taken normal to the direction of forging. Expts. on the heat treatment of Ni-V steel with 3.45% Ni and 0.27% V, showed that the cast metal is harder and the forged metal more ductile. The effect of varying amts. of Ni and Cr on the critical temp. of steel with 0.50% C and 0.50% Mn was studied and it was found that increasing Ni content lowered the critical temps. with Ar_1 decreasing more rapidly than Ac_1 but with Cr the critical temp. rizes with increasing Cr content, Ar_1 rizing faster than Ac_1. Bronzes were examd. with regard to the size of grain and strength. The microscopic structure of these bronzes was interesting because of the great difference in the fractures of the various specimens and the correlation of the structure with the mechanical properties of the alloy. The microscopic examn. of test specimens of gun forgings was undertaken to obtain information regarding the heat treatment of gun steels and to get data as to the possibility of incorporating into the existing specifications a clause relating to the type of microstructure. The usual structure was found to be sorbitic, indicating proper heat treatment but in some cases the specimens showed a less desirable structure with well-developed cell walls of ferrite. In studying the erosion of guns, further evidence was obtained on the cause of the hard surface layer in guns. Such a layer could result from the steel being heated above the critical temp. followed by rapid cooling, by cementation caused by the products of combustion of powder at the prevailing high temp. and pressure, or by mechanical work due to the friction of the rotating band in the gun. A study of the metal showed that erosion was not due to cementation. as no cementite was found by the Na picrate test. The cause of erosion is evidently a combination of heat effect and mechanical work. The rotating band of the projectile produces enough friction to cause a flow of metal and the formation of a hard, amorphous layer on the rifling of the gun. The action on the pressure plugs was selective and the max. hardening effect was observed where the metal had been strained previously as by stamping letters with a die. Thus, in stamping the letter O, some metal was compressed toward the center of the letter and the hard layer appeared uniformly on the inner edges of the letter with hardly a trace on the outer

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edges. Troostite was found adjacent to the hard layer in some cases, but martensite has not been found; its normal structure is probably destroyed by plastic deformation, although the hard layer by tempering breaks down into troostite.

JULIAN S. GRAVELY.

Exposure tests of light aluminium alloys. E. WILSON. *Electrician* **75**, 886 (1915).—To study the influence of exposure upon elec. resistance, specimens of the alloys in the form of wire 0.126 in. diam. were exposed on the roof of King's College, London. The elec. resistance of commercial Al (0.14% Si + 0.31% Fe) has steadily increased during 13 yrs. With specimens containing 2.61–1.86% Cu, the elec. resp. in a given time increased the faster the higher the % of Cu. Al samples containing 0.35–1.78% Mn, 0.03–0.09% Cu, 0.31–0.44% Si, 0.35–0.56% Fe, have increased about 10% in 14 yrs. whereas samples with 1.29% Ni, 1.08 Cu, those with 0.6–2.04% Zn, 0.17–0.09% Cu and those with 0.21–0.11% Cu, 1.77–1.94% Zn, and 1.13–2.01% Ni showed a reduction of elec. resistance. The elec. resistance of *duralumin*, containing 0.5% Mg, 3.5–5.5% Cu and 0.5–0.8% Mn increased 9.6% in 4 years.

Z. SMILOVICI.

Testing of materials. R. G. BATSON. England. *Trans. Intern. Eng. Congress* **1915** (advance copy), 52 pp.—The ordinary static tensile test is insufficient for purposes of design except in very simple cases; the test piece must be subjected to the conditions to which the actual material will be subjected. Thus, in a series of tensile tests on 15 m. lengths of hard drawn Cu wire very small kinks lowered the breaking load 7% and the total elongation 30%. The temp. of testing is also of importance; between 20° and 60° a rise of 1° corresponds to a decrease of 0.1% of the breaking load and an increase of 0.3% in total elongation at 15°. The "apparent" modulus of elasticity obtained by the first loading of a long length of wire is much lower than the actual modulus. With regard to fatigue testing the conclusions of L. Bairstow (*Trans. Roy. Soc. London* **210**) are given. The principal objections to the commercial adoption of the fatigue test are its cost and the apparent variation in the endurance strength of the test pieces cut from the same bar. There is need of more information upon the question of combined stress in fatigue. Three theories have been advanced to explain how a ductile material fails under any system of stresses: (1) The material yields when one of the principal stresses reach a certain amount; (2) the material yields when the max. strain reaches a certain amt.; (3) the initial yielding corresponds to the existence of a specific shearing stress. With regard to impact testing the tensile impact test has given numerical results agreeing with the static tensile test, hence the dynamic tensile test may take the place of the static tensile test for most purposes. The results of hardness and abrasion testing are given. The paper contains very extensive bibliographies.

DONALD BELCHER.

Detection of internal blowholes in metal castings, by means of X-rays. C. H. TONAMY. Nutsubishu Engineering Works, Kobe, Japan. *J. Inst. Metals* (advance copy) **12**, 4 pp. (1915); *Engineering* **100**, 339 (1915).—Radiographs are given of a thin (1/4 in.) Cu casting, made with a Gundelach X-ray tube at 15 cm. distance, 5 min. exposure, with 2 milliamperes through the tube. The radiographs show blowholes, the presence of which was verified by sawing up the sample.

H. W. GILLETT.

Molten zinc as a reagent for the macroscopic etching of iron and steel. J. L. JONES. *Chem. Eng.* **22**, 124–5 (1915).—In ascertaining the relative values of ingot Fe, Norway Fe, and open-hearth steel for making galvanizing pots, bars of these materials were dipped in molten Zn, removed and the mass of dross struck off. By immersing the bars in dil. H_2SO_4 the Zn coating is removed, leaving pitted surfaces, indicating areas of high C, etc. In cases where compression had not sufficiently removed porosity, soln. of Fe in molten Zn was indicated by shelly structure.

DONALD BELCHER.

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Charpy impact test on treated steels. J. J. THOMAS. *Iron Age* **96**, 138–40(1915). —The Charpy test is of value in detg. the toughness of heat-treated steels. No reliable comparisons can be made by breaking single specimens; from 4 to 6 should be tested. The max. resistance seems to be reached in quenched steels by drawing or tempering at 650°. D. B.

Hydraulic hardness-testing machine. ANON. *Met. Chem. Eng.* **13**, 646(1915). —A machine measuring hardness by the width of indentations made by known pressures. D. B.

The failure of structural brasses. P. D. MERICA AND R. W. WOODWARD. *Trans. Am. Inst. Metals* (advance copy) **8**, 19 pp.(1915).—Season-cracking and similar failures occur in brass which is under initial stress, provided these stresses average over approx. 6000 lbs. per sq. in. These stresses may be entirely removed by annealing at from 300° to 400°. Brass may be manufactured practically free from stresses and still not be too soft. D. B.

Standard test specimen of zinc-bronze: Cu 88, Sn 10, Zn 2. Relation of the mechanical properties to the microstructure. H. S. RAWDON. *Trans. Am. Inst. Metals* (advance copy) **8**, 15 pp.(1915).—A series of 44 specimens were examd. in detail, the results showing that of those having an ultimate tensile strength of 30,000 lbs. per sq. in. or less (13 in number), all show oxide films and pits. Twelve specimens had an ultimate strength of 30 to 35,000 and 10 showed a film of oxide. Oxide was found rarely in specimens of strength 40 to 45,000 lbs. The presence of Sn oxides may be considered the main factor of weakness in cast bronze. Cu_2O may also be present. Previous investigators have found that Cu_2O and SnO_2 are insol. in metals and the appearance of the pits and films indicates mechanical suspension. D. B.

Metallography and the hardening of steel. ALBERT SAUVEUR. Harvard Univ. *Trans. Intern. Eng. Congress* **1915** (advance copy), 8 pp.—A short historical review and summary of the theories advanced to explain the hardening of steel. D. B.

Testing full size members. G. LANZA. *Trans. Intern. Eng. Congress* **1915** (advance copy), 17 pp. D. B.

Methods of preventing piping in steel ingots. E. GATHMANN. *Trans. Intern. Eng. Congress* **1915** (advance copy), 4 pp. D. B.

The influence of time of annealing on the softening of stretched bronze wires. W. MÜLLER. *Metall u. Erz.* **12**, 213–20(1915); illus.—The material used was Mg bronze. The wire was drawn in 6 stages from 14.6 mm. without intermediate annealing and after each drawing, samples were annealed at different temps. for 15, 30 and 60 min. The results showed that in general with the same time and temp. the strength diminished with the amt. of drawing to which the wire had been subjected. An exception to the rule is that with complete annealing at 700° the strength of the more severely drawn wires was higher than the others. At temps. below 300° the strength becomes practically const. after 60 min. annealing and the completely annealed state cannot be reached. At 700° the specimens were completely annealed after 15 min. The temp. at which softening begins varies from 60° to 300°, depending on the amt. of drawing to which the wire has been subjected. The microscopic structure of the material was studied. CARLE R. HAYWARD.

Measuring temperatures for heat treatment processes. F. G. COBURN. *Am. Mach.* **43**, 511(1915).—A discussion of actual experiences, including elementary information. Likewise C. discusses the construction of thermocouples, how they operate and why they frequently give unsatisfactory results. C. G. F.

Iron and steel castings. JOHN H. HALL. *Trans. Intern. Eng. Congress* **1915** (advance copy), 12 pp.—The paper is a concise presentation of the differences between

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the various irons and steels, the effects of different impurities, the effect of oxidation, etc. D. B.

The iron-carbon equilibrium diagram. OTTO RUFF. *Ferrum* **12**, 121–3(1915). —A reply to Henry M. Howe's criticism. CARLE R. HAYWARD.

The "near-eutectic" temperature of the iron-carbon alloys. OTTO RUFF AND WALTER BORMANN. *Ferrum* **12**, 124–6(1915).—The "near-eutectic" temp. is defined as the satn. pt. of the metal for both graphite and austenite. The temp. was found to be 1138.8 ± 1°. CARLE R. HAYWARD.

The magnetic transformations in iron-carbon alloys. G. RUMELIN AND R. MAIRE. *Ferrum* **12**, 141–54(1915).—Fe-C alloys with 0.11–0.43% C cooled or heated slowly show at Ar_2-Ac_2 sharply defined reversible magnetic transformation point. Above this temp. the alloys are still weakly magnetic. The magnetism changes continually and reversibly between A_2 and A_3 where the magnetism completely disappears. As the C content increases from 0.4 to 0.8% the temp. hysteresis increases while the temp. of transformation sinks to Ac_1. Eutectoid and hyper-eutectoid steels show at the pearlite point an irreversible transformation at the sharply defined points Ac_1 and Ar_1. They all have the same transformation temp. CARLE R. HAYWARD.

Spontaneous generation of heat in recently hardened steel. C. F. BRUSH. *Proc. Am. Phil. Soc.* **54**, 154–64(1915).—Bars of tool steel were hardened by heating in a reducing at. and quenched in cold water. They were then placed in an app. equipped to measure small temp. differences. The steels spontaneously generated a considerable amt. of heat. the temp. rizing steeply about 5° and then dropping slowly. High-speed W steels gave similar results. It was found that the metal expanded a little when hardened and contracted when annealed. This was shown by sp. gr. detns. Another investigation showed that a shrinking accompanied the spontaneous generation of heat. The internal work represented by the heat generated was several hundred times the work done in contracting the specimen. It may be considered that the hardened steel is in a condition of great molecular strain, and that spontaneous relief of this strain produces heat until stability at room temp. is reached. Any considerable rise in temp. permits further relief, accompanied by more heat generation, until the annealing temp. is reached. DONALD BELCHER.

Brittleness of rolled wrought iron as a consequence of heating. R. BAUMANN. *Z. Ver. deut. Ing.* **59**, 628–30(1915).—Expts. were carried out as a consequence of observations made that boiler plate after the scale had been hammered off was often considerably scarred and very brittle; this had been referred to the action of rolling the metal followed by temp. changes of great variation. Expts. indicate that there are materials which, when rolled and annealed to a yellow color, are very brittle after cooling. The production of sharp scars or the effect of rolling alone are not sufficient as a rule to produce a far-reaching brittleness. B.'s expts. confirm the old rule that unnecessary sharp notches, curves, etc., should be avoided. A method is described which is applied to the testing of boiler plate, and many plates that have passed the usual tests and have failed in practice, fail to pass this test. The test has been extended to apply to plates which are 20 mm. in thickness and have a tensile strength of 4100 kg. per sq. cm. The effect of rolling direction was distinctly marked as observed by the notched bar test. H. R. G.

The influence of phosphorus on the mechanical properties of gray cast iron. F. WÜST AND R. STOTZ. *Ferrum* **12**, 89–96, 105–19(1915).—The static strength tests on the specimens showed that gray cast Fe was improved with additions of P up to 0.3%. Above 0.6% the influence of P was bad. Shock tests indicated that the influence of P was bad up to 0.6%. Further additions had slight effect. The effect of

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P is not greatly influenced by the presence of other elements. Even P-rich cast iron with 1% Mn may be satisfactory if the other constituents are correctly proportioned. The structure of gray castings is changed in 3 ways by the addition of P. The graphite collects in pockets, a P-bearing ternary eutectic appears and the pearlite becomes a mixt. of coarsely lamellar plates and sorbite. CARLE R. HAYWARD.

The manufacture of pure iron. HOWARD SEE. *Iron Coal Trades Rev.* 91, 41 (1915).—A detailed description of processes for making rust-resisting iron. H. L. OLIN.

Dynamic properties of steel castings. J. L. UHLER. *Iron Age* 96, 754–6(1915). —Fatigue tests were made on a great number of specimens of V and Ni-Cr steel. Static tests were also made. The results show that the static results are what would be expected from the different chem. compn., the dynamic results vary for approx. the same compn. It seems reasonable to consider the amt. of structural damage during a cycle of stress to be proportional to the energy transformed into heat, *i. e.*, to the area of the hysteresis loop. DONALD BELCHER.

Alloy steels. G. L. NORRIS. *Met. Chem. Eng.* 13, 739–42(1915).—A review of the Mn, Si, Ni, Cr, W and V alloys of steel, describing their compn., properties and uses. D. B.

Neglected phenomena in steel treatment. M. E. LEEDS. *Iron Age* 96, 80–2 (1915).—In expts. on variations in rates of heating of specimens of different size to various furnace temps., it is found: (1) The smaller specimens heat more rapidly than the larger. (2) Higher temps. are obtained more rapidly than low, due probably to the greater transfer of heat by radiation at high temps. (3) There is no large difference in temps. of the points inside the specimen. (4) Interior thermocouples give approx. the temp. of transformation. D. B.

Commercial production of sound steel. E. F. KENNEY. *Iron Age* 95, 1343–6 (1915).—A special type of sinkhead applied to an inverted ingot reduces segregation and piping to a minimum and produces a uniform steel. D. B.

Alloy steels in bridgework. J. A. L. WADDELL. *Trans. Intern. Eng. Congress* 1915 (advance copy), 35 pp. D. B.

Alloys and their use in engineering construction. W. R. WEBSTER. *Trans. Intern. Eng. Congress* 1915 (advance copy), 15 pp. D. B.

An investigation of fusible tin boiler plugs. G. K. BURGESS AND P. D. MERICA. U. S. Bur. Standards. *J. Wash. Acad. Sci.* 5, 461–2(1915); *J. Ind. Eng. Chem.* 7, 824–9(1915).—Of the four classes of deterioration in plugs one could be called dangerous, namely the formation of SnO_2, either as a solid mass at the fire end of the plug or as a network throughout the Sn filling. The latter form of oxidation depends on the presence of Zn in amts. as small as 0.3%. Pb and Zn were found to be the principal impurities, and all plugs that failed contained these or other impurities. Freezing points of Sn obtained from cooling curves will serve to detect Pd or Zn as low as 0.1%. DONALD BELCHER.

Many high speed tools. F. C. A. H. LANSTERRY. *Iron Age* 96, 238–41(1915). —A review of the various theories of high speed tools. D. B.

The annealing of brass cartridge cases. L. J. KROM. *Metal Ind.* 13, 359–63 (1915). D. B.

Old and new methods of making carwheels. C. V. SLOCUM. *Iron Age* 96, 676–9 (1915).—High S is allowed in Fe carwheels although such practice is dangerous. D. B.

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Effect of changes in the composition of alloys used by the American railways for car journal bearings. G. H. CLAMER. *Trans. Am. Inst. Metals* (advance copy) 8, 24 pp.(1915).—A large number of alloys of Cu, Pb, Sn and Zn were studied as regards resistance to compression, tensile strength and scleroscope hardness. Data on friction and wear tests are also given. The conclusion is drawn that (1) 65% Cu is minimum for car journal bearings. (2) There should be a proper balancing of the Cu, Sn, Pb, and Zn. (3) The % of Sn should not exceed approx. 5%. (4) The content of Pb should be increased rather than that of the Zn. (5) The alloys containing approx. 5% Sn, up to 20% Pb, up to 5% Zn should be entirely satisfactory. D. B.

The advantages of a standard railroad car-bearing alloy. R. R. CLARKE. *Trans. Am. Inst. Metals* (advance copy) 8, 19 pp.(1915).—A discussion of the merits of the case for adopting a standard, and a list of qualifications for such a standard. D. B.

Infantry projectiles. UTZ. *Pharm. Zentralhalle* 56, 119–24(1915).—Description of physical appearance and chem. analyses of English, French, German, and Belgian rifle bullets. C. O. EWING.

A continuous rotary heat-treating furnace. F. M. PAULL. *Iron Age* 96, 569 (1915). D. B.

Solubility of metals in water. VICENTE M. ISNARDI. La Plata. *Anales soc. quim. Argentina* 1, 214–21(1913).—Thin plates of Pb, Fe, Cu, Zn, Sn, Ag and steel (Gillette razor blades) of uniform dimensions (4 × 2 cm.) were employed in the tests; these plates were all highly polished (to render the surfaces as uniform as possible and eliminate scratches which would interfere with microscopic examn.) and washed with water, soap, alc. and Et_2O. The plates were placed in Jena glass flasks of nearly uniform compn. and subjected therein to the action of twice distd. H_2O, the vol. of which was maintained accurately throughout the expts. at 70 cc. Six series of expts. were performed, in 3 of which the plates were subjected to the action of H_2O at 18–22° for 10, 20 and 30 days, resp., while in the other 3 series the periods of contact were 1, 2 and 3 hrs., resp. at 100°. The progress of the action was followed in all cases by: (1) Observation of the variations in wt. of the plates; (2) microscopic examn. of the plates; (3) detn. of the elec. cond. of the H_2O. Complex substances, the compns. of which were not ascertained, were formed by the action of H_2O on the metals; it is possible that dissolved silicates of the glass flasks participated in the reactions. Definite solubilities were not detd., but comparative sp. cond. curves were obtained, the sp. cond. curves of H_2O alone (kept in a Jena glass flask at the temps. and periods of time in question) being taken as a basis of reference; the conds. of the latter were, of course, included in the conds. of the samples of H_2O in which the metallic plates were immersed. The curve (sp. cond. = (f) time at 18–22°) for Pb was the most regular and showed rather uniform proportionality between cond. and time. The curve for Cu came next in this regard; the cond. increased rapidly during the 1st 10 days, then slowly during the 2nd 10 days, while the cond. was practically const. during the 3rd 10 days. The curve for Zn showed peculiar characteristics. The cond. increased slowly during the 1st 20 days; this was followed by a very rapid increase during the last 10 days to the highest cond. observed in the series. The conds. in the case of Fe and steel were very slight, although the loss of wt. and microscopic exam. indicated considerable corrosion. The cond. curves in the case of Sn and Ag indicated a practically negligible increase in cond. above the cond. of the comparison liquid (H_2O alone in a Jena glass flask); no corrosion, ppt. or decrease in wt. was observed in either case. A definite solubility in H_2O is indicated in the case of those metals for which the H_2O employed showed a distinct increase in cond. H. S. PAINE.

Recent progress in corrosion resistance. D. M. BUCK. *Iron Age* 95, 1231–9 (1915).—C, Mn, P and Si in amts. usually present in steel have a negligible effect on

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corrosion. High content of S, without Cu, promotes corrosion. 0.25% of Cu increases the life of Fe and steel, and, moreover, neutralizes the effect of S up to 0.14%. More Cu, up to 2%, gives little or no greater benefit. Steels carrying as little as 0.04% Cu are much superior to those containing only a trace. In the discussion of the paper A. S. CUSHMAN stated that B.'s method for testing is open to criticism since losses of wt. by rusting do not give a good idea of corrosion under service conditions. There is also evidence to show greater loss in wt. on the part of Cu steels than with ordinary steels. The real reason for improvement which has resulted from efforts to introduce Cu lies in the greater purity, better degasification and decreased segregation of the modern material. C is believed to be deleterious on account of difficulty in degasifying. Mn and S should both be eliminated. B.'s theory that Cu reduces the tendency to corrosion because it is electronegative to Fe is unreliable because Si, although electronegative, does not check corrosion. In the general discussion, J. O. Handy, W. H. Walker, J. S. Unger, and G. H. Charls confirm B.'s conclusions. D. B.

The effects of the common impurities in spelter upon slush castings. GILBERT RIGG AND HENRY C. MORSE. *Trans. Am. Metals* (advance copy), 8, 32 pp.(1915); illus.—The effects of Cd, Pb, Fe, As and Al in spelter upon slush castings is detd. both by tests on actual castings and by microscopic exam. The conclusion is drawn that: (1) Cd unfits spelter for use in castings where power of resistance to cooling stresses is required; (2) Pb weakens the castings, and produces a tendency toward heavy castings; (3) the influence of Fe is very erratic but the tendency is toward weakening; (4) As, in amts. usually present in spelter, has little or no effect; (5) Al in amts. from traces to 5.0% produces alloys that cannot be used in slush castings; but with from 5.0 to 5.5% Al the alloy with pure Zn is very suitable. D. B.

Sherardizing. S. TROOD. *Trans. Am. Inst. Metals* (advance copy), 8, 11 pp. (1915).—The paper presents the results of an investigation into the essential factors in sherardizing. These were found to be: 1. A pure surface to be sherardized. 2. The comp. and uniformity of Zn dust. 3. Proper uniform temps. 4. Time. D. B.

The influence of different elements upon the corrosion of iron. L. C. WILSON. *Eng. Mag.* 50, 78–86(1915).—A review of the literature on this subject with special reference to the work of Buck upon Cu-bearing steels (cf. *C. A.* 7, 3304).
W. E. RUDER.

Corrosion of iron and steel. W. J. E. BINNIE. *Surveyor* 47, 536–40(1915). —After discussing the causes of the corrosion of Fe and steel, details are given of the failure and treatment of the steel pipe line from Mundaring to Kalgoolie, Australia. W. D. C.

Protective coatings for metals. H. B. C. ALLISON. *Gen. Elec. Rev.* 18, 878 (1915).—A review. C. G. F.

Metallic preservative coatings. E. H. FISH. *Am. Mach.* 43, 371(1915).— —Present-day methods of tinning, galvanizing and sherardizing are described.
C. G. F.

Oxy-acetylene welding and cutting equipment. S. W. MILLER. Rochester. *Machinery* 22, 85–100(1915); see also *ibid* 22, 100–16(1915).—This is a very comprehensive paper on present welding practice, including detailed accounts of the various commercial processes of manuf. of O and C_2H_2. 24 illus. C. G. F.

Autogenous process of cutting steel. R. PLIENINGER. *Z. kompr. Gase* 16, 6–11, 21–5, 45–50, 72–6, 87–97, 131–9(1914); *Z. angew. Chem.* 28, II, 7–8(1915).—The O consumption is much greater than required by theory, being about 250% in excess with 99% O and 560% excess with 81% O. The excess required by a low % O can be reduced by working at high pressure. Preheating the O and the metal and proper choice of

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pressure lead to a saving of time and of gas. With a high-% O the alteration of the metal at the point of cutting is about 0.8 mm. deep; with low-% it is considerably deeper. E. H.

Functions of sand binders. H. M. LANE. *Metal Ind.* 13, 421–3(1915).—A discussion of the functions of sand binders in the manuf. of cores for various kinds of metal castings. L. classifies binders as: (1) H_2O-sol. (molasses, sour beer, distillery refuse, paper mill waste products, corn syrup waste products, glue, and Na silicate); (2) paste binders (wheat and rye flour, including fine ground white corn used as an adulterant for wheat flour and pea meal, starch, and dextrin); (3) colloids and allied substances (clay, MgO, milk of CaO, Al compds. and Fe compds. or combinations of these); (4) gums (resin, coal-tar pitch, wood-tar pitch, asphalts, petroleum pitches); (5) oils of all kinds. F. W. SMITHER.

A preliminary report on welding sands. C. P. KARR. U. S. Bur. of Standards. *Trans. Am. Inst. Metals* (advance copy) 8, 14 pp.(1915).—This paper attacks the problem of distinguishing between good and bad molding sands. It describes tests to asceratin the texture, permeability and transverse strength of the sand. Different grades of sands are suggested for the various metals. D. B.

Albany molding sand. D. H. NEWLAND. *Trans. Am. Inst. Metals* (advance copy) 8, 5 pp.(1915).—A preliminary report on investigations of molding sands used in eastern foundries. D. B.

Determination of critical points in iron, steel and alloys 4. Ammunition manufacture in Canadian and American plants (HEYN) 24. Chemistry of cyanide compounds (CLENNELL) 6.

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ENGINEERING STANDARDS COMMITTEE: **British Standard Specification for Copper-Alloy Three-Piece Unions.** London: C. Lockwood. $1.25.

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WALSH, J. J.: **A Practical Handbook on the Physics and Chemistry of Mining and Mine Ventilation.** New York: Van Nostrand Co. 187 pp. $2.00.

WIARD, E. S.: **The Theory and Practice of Ore Dressing.** New York: McGraw-Hill Co. 426 pp. $4.00.

U. S., 1,154,601, Sept. 28. O. BEST. **Obtaining zinc from ores, smelter fumes, etc.** —The Zn-bearing material is roasted at a low temp. with $FeSO_4$ or $ZnSO_4$ to sublime As and remove organic matter and then leached with a small excess of H_2SO_4. The soln. obtained is purified by treatment with ZnO and Na_2S and the purified soln. is treated with $Ca(OH)_2$ to ppt. $Zn(OH)_2$ and $CaSO_4$ and the mixt. is washed with H_2O to remove sol. impurities. Pure $ZnSO_4$ soln. is electrolyzed to obtain metallic Zn and

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the residual acid soln. is pumped over the $Zn(OH)_2$-$CaSO_4$ mixt. to neutralize the acid formed by electrolysis and then returned to the electrolytic cell.

U. S., 1,154,602,. Sept. 28. O. Best. **Obtaining zinc from ores, etc.** The material is lixiviated with H_2SO_4, lime is added to ppt. impurities, leaving a practically pure $ZnSO_4$ soln. of 1.2–1.4 sp. gr. The Zn. is pptd from the soln. by a further addition of lime after filtration. The $Zn(OH)_2$ and $CaSO_4$ ppt. is washed with H_2O and the latter is then displaced by strong $ZnSO_4$ soln. and by an acid soln. from an electrolytic cell in which Zn is deposited from $ZnSO_4$ soln. The acid soln. is neutralized and its desired concn. restored by this treatment.

U. S., 1,154,802, Sept. 28. S. Peacock. **Smelting zinc ore.** SiC is mixed with ZnO in the mol. proportions of 1:3 and the mixt. is heated to effect reaction in an ordinary smelting app. as used for smelting with C. Less "blue powder" is formed than when smelting with C.

U. S., 1,155,317, Sept. 28. C. Mark and C. Mark, Jr. **Applying a protective coating to iron and steel articles.** The articles are introduced into a bath of Pb (containing about 2–8% of Sn and 1–2% of Zn and maintained at a temp. of 330–405°), through a flux of NH_4Cl containing Fe and Zn salts. Zn is added to the bath from time to time as required to maintain the desired %.

U. S., 1,155,628, Oct. 5. S. Truax. **Zinc-bearing slag** is melted and the molten material is allowed to stand on a bed of C particles held together by a binder of plastic clay while CO bubbles up through the slag, effecting reduction and volatilization of the Zn.

U. S., 1,155,815, Oct. 5. A. H. Higgins and W. W. Stenning. **Apparatus for concentrating ores by gaseous flotation** of certain constituents while suspended in liquid.

U. S., 1,155,816, Oct. 5. A. H. Higgins. **Apparatus for concentrating ores by gaseous flotation.**

U. S., 1,155,836, Oct. 5. T. M. Owen. **Apparatus for concentrating ores by gaseous flotation.**

U. S., 1,155,849, Oct. 5. W. R. Walker. **Manufacture of steel.** Molten Fe containing Mn is treated in an acid-lined Bessemer converter or open hearth furnace to effect at least partial removal of Si and C while retaining Mn in the metal and then the metal is transferred to a mixing app. in which the distribution of the Mn is rendered more nearly uniform. The product is then treated in a basic-lined elec. furnace.

U. S., 1,155,861, Oct. 5. L. A. Wood. **Method of concentrating ores by treatment with frothing liquid** and a current of gas.

U. S., 1,155,974, Oct. 5. T. van Aller. **Rendering iron, copper or other metals non-oxidizable.** The metal is heated in a non-oxidizing atm. in contact with a powdered mixt. of Al and NH_4Cl which forms a superficial layer of Al alloy on the metal.

U. S., 1,156,051, Oct. 12. J. I. Bronn. **Steel is made by melting refined Fe, adding to it Mn or Mn alloy and C and combining the soln. thus obtained with a larger body of molten refined Fe constituting the main portion of the charge.**

U. S., 1,156,093, Oct. 12. C. Pack. **Finished die-cast white metal castings** are made by pouring an alloy of Al 80–91 and Cu 20–9 parts into a metal mold and withdrawing the molded article immediately after the superficial portion has solidified and become chilled, before much contraction of the casting has taken place in the mold.

U. S., 1,156,169, Oct. 12. J. F. Monnot. **Copper-coated iron or steel sheets** with a superficial Zn alloy forming part of the coating layer, are prepd. by conducting Cu-coated sheet metal through the chamber of a furnace where it is exposed to vapors

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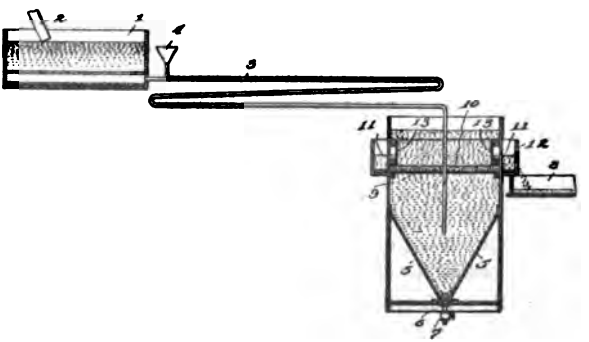
from a bath of molten Zn. This gives the surface a brass-like appearance. A similar effect may be secured also by electroplating with Sn and Zn, dipping in a bath of molten Sn and Zn or heating with powdered Al.

U. S., 1,156,170, Oct. 12. W. M. PAGE. **Copper-coated steel wire** is made by passing the wire through a pickling bath or treating it with steam to oxidize and decarbonize it, superficially reducing the oxidized surface to form pure Fe and then forming a thin coating of Fe-Cu alloy on the surface of the wire by passing through molten Cu- or Cu-Fe alloy in a reverberatory furnace. Neutral gas or steam cools the wire and protects it from oxidation.

U. S., 1,156,220, Oct. 12. P. FARUP. **Titanium oxide from ilmenite or titaniferous iron ores.** See Ger., 276,025 (*C. A.* 9, 362).

U. S., 1,156,382, Oct. 12. R. S. TOWNE and C. ROBINSON. **Method of dissolving metals from ores** by the action of successive portions of solvents circulated in a closed system.

U. S., 1,156,383, Oct. 12. R. S. TOWNE and C. ROBINSON. **Gold and silver from cyanide solutions** are pptd. by Zn by leading the soln. from a clarifier *1* (for permitting sedimentation of impurities) into the pipe *3* and feeding powdered Zn in at *4*. A layer of finely divided Zn *10* on a screen *9* in the settling chamber *5* and a filtering canvas *13* prevent escape of pptd. values from the outlets *11*.



U. S., 1,156,496, Oct. 12. W. E. RUDER. **Annealing silicon sheet steel.** The sheets are passed through a chamber, charged with H and maintained at a temp. of 1300–1500°, at a speed which will permit them to attain a temp. of 1000° within a few min. and then are cooled at about the same rate in a non-oxidizing atm.

U. S., 1,156,606, Oct. 12. J. W. LAWRIE. **Aluminium skimmings, screenings, dross, slags, etc.,** are treated with a 30–40% NaOH soln. which dissolves most of the Al present by the heat of the ensuing reaction, then heat is supplied from an external source to complete the dissolving action. Gases from the mixt. are drawn off by a vacuum pump, the aluminate soln. formed is sepd. and impurities such as Cu and Zn are pptd. from it as sulfides.

U. S., 1,156,679, Oct. 12. B. FORD. **Carburizing iron or steel.** The metal is melted in a chamber free from oxidizing gases, covered with a layer of gasoline vapor, CN compd., lamp black, bone black, or other carburizing agent and heated electrically until sufficiently charged with C by absorption from the overlying layer.

U. S., 1,156,775, Oct. 12. H. HAAS. **Obtaining iron or steel from iron ores.** Fe oxide ores are smelted with fluxes without reducing the oxides at first and petroleum at a temp. above its ordinary flash point is forced through the molten oxide to reduce the charge to metallic Fe. The petroleum is kept under sufficiently high pressure to maintain it in a liquid state until released through an atomizing nozzle as a fine vapor which passes into the charge of oxides.

U. S., 1,157,153, Oct. 19. G. DE BECHI. **Separating lead from zinc in sulfide ores.** The ore containing both Pb and Zn is powdered and treated with a mixt. of

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$Fe_2(SO_4)_3$, H_2SO_4 and HNO_3, which converts the sulfides into sulfates with the liberation of free S. The $ZnSO_4$ in soln. is removed from the insol. $PbSO_4$ by filtration and H_2SO_4 is regenerated from the $ZnSO_4$, by calcining, leaving a residue of ZnO. The NO produced is reoxidized and converted into HNO_3 for further use.

U. S., 1,157,176, Oct. 19. T. M. Owen. **Selective flotation of lead and zinc sulfides.** Slimes containing sulfides of Pb and Zn are treated with K (or other alkali) permanganate soln. to increase the selective action on flotation and are then agitated with a flotation medium, *e. g.*, a eucalyptus oil mixt. The floated concentrate rich in Pb is removed and after adding acid, preferably H_2SO_4, the residue is again agitated and the floated concentrate carrying most of the Zn is removed. Cf. *C. A.* **9**, 2055.

U. S., 1,157,283, Oct. 19. M. A. Atuesta. **A rust-proof black finish on iron or steel** is produced by coating with Zn ("sherardizing") and then heating in charred bone dust with a binder of coal tar and quenching in linseed oil.

U. S., 1,157,375, Oct. 19. J. J. Fingland. **Obtaining spelter from mixed iron-lead-zinc ores.** A mixt. of crude ore, roasted ore, and CaO is heated to form PbO and the heating is continued until the PbO is volatilized. Then the temp. is raised to 1500° and a mat containing Zn and Ca S and O compds. is obtained. The mat is cooled and crushed and heated with C out of contact with air to reduce and distill the Zn. The residue is roasted and treated to recover Au, Ag or Cu, which is present and, after screening, Fe is sepd. from it by magnetic treatment.

U. S., 1,158,055–6, Oct. 26. D. J. Kelly. **Process and apparatus for filtering ore slimes, etc.**

U. S., 1,158,128, Oct. 26. K. Goldschmidt and J. Webber. **Detinning tin-scrap.** Compressed scrap is treated with Cl in a closed chamber while the gases in the chamber are stirred or circulated sufficiently to equalize the temp. and maintain it below the point at which the Fe would be attacked.

U. S., 1,158,318, Oct. 26. H. E. Sheldon. **An ingot-mold for casting steel ingots** is formed of steel containing about the same % of C as the steel to be cast in it. The material of the mold may also contain Mn, S and P. The molds are more durable than cast-Fe molds.

U. S., 1,158,363, Oct. 26. D. H. Bibb. **Briquets of iron ore, flue dust, etc.,** are formed with a binder of pyroligneous tar from which the more readily volatile substances have been driven off.

U. S., 1,158,364–5, Oct. 26. D. H. Bibb. **Briquets of ore, flue dust, etc.,** are formed by using a binder of coned. waste sulfite liquor, and after molding the mass is heated to about 315° for 20 min. to render the binder H_2O-resistant, without coking it.

Aust., 571, Jan. 22, 1912. Gubinol Ges. m. b. H. Machine for mfg. brown color powder or the like.

Brit., 11,103, May 5, 1914. F. K. Siemens. In a tunnel furnace for the continuous heating or annealing of metal articles in a reducing atm. of combustible gases inert gases (*e. g.*, combustion products) are supplied, prior to opening the furnace for charging or discharging, for dilg. the combustible gas to such an extent that it will not burn or explode on coming into contact with air.

Brit., 11,224, May 6, 1914. H. C. Alford. In the direct reduction of iron ore the ore is first heated to 1000° F. or upwards, without access of air, and is mixed while hot with solid or liquid carbonaceous reducing agents, the C being in sufficient excess to prevent re-oxidation of the metal. The ore first traverses a rotary cylinder fitted with a screw conveyor, and is then discharged into a second cylinder in admixt. with

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coal, etc., from a hopper. The spongy metal is discharged through an outlet and reduction gases, which consist mainly of Co and H, escape through an outlet. The cylinders are heated by combustion products from a fire-box comprizing upper and lower chambers, connected by a restricted neck, and supplied with fuel from a slotted tube, fitted with a screw conveyor and located over an opening. The air supply passes through the conduits of a regenerator, through which the combustion products escape to a flue.

Brit., 11,380, May 8, 1914. K. ILSE and H. REISERT GES. In a process of **cutting metals** by means of an O jet and gas-O heating jet, the latter is supplied, for preliminarily heating the work before cutting, with a mixt. corresponding in comp. to explosive gas, and during cutting, with a comp. poorer in O.

Brit., 13,538, June 3, 1914. A. P. STROHMENGER. In **welding** or depositing metal by fusion of an electrode, a wire or strip of Al or other metal exerting a strong reducing action is laid alongside the electrode.

Brit., 13,606, June 4, 1914. J. VAN N. DORR. App. for **water-concentrating ores,** or otherwise sepg. finely divided solids from liquids by settling, comprizes a number of superposed shallow trays of individual depths such that the settling zone is located directly beneath the zone of surface current or flow of disturbance, the trays having orifices through which the sediment is moved by sweeps or the like into a common exit conduit without passing through or into the settling regions of the other trays. A suitable depth for the trays is 3 ft. or less.

Brit., 13,702, June 5, 1914. C. V. THIERRY and J. M. J. THIERRY. In **condensing metal vapors** by passage through narrow slots, as described in 7,935, 1913, the drops of metal are caused to fall into a chamber arranged in the furnace. The slots are formed between C plates held in metal frames and are covered by a baffle plate. The whole is enclosed by a box having openings for the escape of CO, which may be burned above the box.

Brit., 13,703, June 5, 1914. O. GRAEF. **Silicon steel sheets** for use in making dynamos and motors are first annealed and afterwards pickled in a warm dil. acid soln. and are then washed in a neutralizing soln. and finally dried. The magnetic properties of the material are stated to be improved, and insulating paper may be securely affixed.

Brit., 14,228, June 12, 1914. P. B. TAYLOR. In app. for **coating metal plates with tin, terne,** or other metal or alloy, the finishing rolls have combined therewith one or more wiping rolls adapted to make contact simultaneously with one or more supporting rolls, which may be finishing rolls, and with a plate passing through the finishing rolls, the wiping rolls being driven by frictional contact with the supporting rolls.

Brit., 14,234, June 12, 1914. W. B. EASTON. In a **tube mill** for crushing ore, etc., the pulverized material and H_2O pass through a perforated plate at the discharge end of the mill into a chamber fitted with one or more adjustable vanes which raise the ore and H_2O and deliver it into the hollow discharge trunnion of the mill.

Brit., 14,295, June 13, 1914. A. D. CARMICHAEL and H. S. MONTGOMERY. **Roasting ores.** See U. S., 1,124,696 (*C. A.* 9, 591). The ore is fed to a series of superposed hearths provided with rotary rabbles which are carried by a shaft fitted with luting devices. The openings or passages through which the ore falls from hearth to hearth are controlled by automatic valves. The hearths may be heated by flues, the first or more of the hearths being muffled, and a regulated supply of air being admitted to the remainder.

Brit., 14,437, June 16, 1914. G. R. GEHRANDT. **Refining molten iron** continuously in the crucible of a blast furnace by arranging [illegible] tuyères, a series of oblique tuyères through which air [illegible]

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of the metal bath. The compn. of the metal may be detd. by regulating the vol., temp., and pressure of the blast. Tapping holes for slag and metal are provided. Cf. *C. A.* 8, 3551.

Ger., 283,920, Dec. 12, 1912. P. KRETZMANN. **Process and machine for grinding ores** and the like in hard mills. Cf. *C. A.* 9, 2434.

Ger., 284,149, Aug. 27, 1913. T. CALOW & Co., MASCHINENFABRIK UND EISENGIESSEREI. **Construction and operation of a drying oven** for casting molds.

Ger., 284,236, Oct. 24, 1914. A. BLEZINGER. **Constructional details of a vertical heating furnace for metallurgical purposes.**

Ger., 284,556, Feb. 3, 1914. PERMUTIT AKT.-GES. **Heating metal articles** in furnaces with H_2O seal. The articles before and after the heat treatment are brought into contact with soft H_2O. The treated articles have the highest polish without the spots showing flecks and mat surface. H_2O hard with carbonate is most undesirable.

Ger., 284,557, Feb. 25, 1914. G. RAU. App. for **etching, washing, and drying plates and wires.**

Ger., 284,558, Feb. 5, 1914. VEREINIGTE ELEKTROCHEM. FABRIKEN. **Polishing metal articles** in the scouring tub, with or without the addition of polishing balls. The polishing operation is effected, as a rule, with the addition of soap solns., beer yeast, and the like. In order to prevent the resulting ready oxidation of the metal articles, especially in the case of Fe, H_3BO_3 or a borate is added to the polishing liquid. In connection with soap solns., only so much H_3BO_3 should be added as is sufficient to neutralize excess alkali, so that no free fatty acid results.

10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

The fifth trinitrotoluene (ε) and corresponding dinitrohalogen substitution products. G. KÖRNER AND A. CONTARDI. *Atti accad. Lincei* 24, I, 888–96(1915).—K. and C. in continuing their study of the isomeric trinitrotoluenes (*C. A.* 9, 66, 1478) applied the substitution reaction of NO_2 for NH_2 in dinitrotoluidine. The new trinitrotoluene (ε) studied was 2,3,5-$(O_2N)_3C_6H_2Me$. The dinitrotoluidines which could be thus used would be the 3 derivs. like (ε) in which 1 NO_2 is NH_2. The earlier expts. showed that the NH_2 in an aromatic NO_2-substituted amine is easily substituted by NO_2 if the NH_2 is *o*- or *p*- to NO_2 groups and with difficulty when in the *m*-position. Thus 3,5-dinitro-*o*-toluidine (*a*) was used. (*a*) has been obtained by treating dinitro-*o*-cresol Et ether with NH_3-EtOH (Städel, *Ann.* 217, 183). Lellmann and Würthner (*Ann.* 228, 240) treated *o*-MeC_6H_4NHAc with HNO_3 + HOAc and obtained a mixt. of 2,5- and 2,3-$AcNH(O_2N)C_6H_2Me$, which was sapond. partially with KOH in EtOH; only the 2,5-compd. was sapond. and the compds. were sepd. by crystg. from EtOH. If recrystd. before sapon., the 2,5-compd., being less sol., seps. 1st, in short white needles. The 2,3-deriv. sepd. from the mother liquor as large, prismatic plates, m. 158°. When either of the compds. or the mixt. are treated with 6 times their wt. of HNO_3 (d. 1.52) at 0° and poured on ice the *acetyl derivative* (*b*) of (*a*), short, white needles, m. 205.2°, is obtained. (*b*) heated 10 min. at 105° with 6 times its wt. of concd. H_2SO_4 and poured into H_2O sepd. (*a*), m. 213°. (*b*) was also obtained by adding *o*-MeC_6H_4NHAc in small portions to 6 times its wt. of HNO_3 (d. 1.52) at 0° and pouring on ice after some hrs. A better way to obtain (*b*) was the following: an enameled iron cup, packed in a freezing mixt., containing 500 g. HNO_3 (d. 1.5) was violently stirred with a spiral stirrer run by a motor while *o*-MeC_6H_4OEt (b. 184–184.5°) was added drop by drop(!). The mixt. was poured on ice; $(NO_2)_2MeC_6H_2OEt$ (*c*), seps., m. 58.4°, is extremely sensitive to

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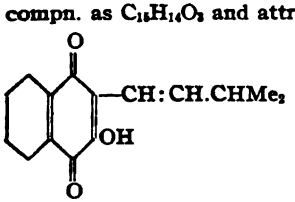
light. *o*-MeC_6H_4OMe similarly treated gives the di-NO_2 deriv. (*d*), m. 66.5°, is more sensitive to light. *o*-$(NO_2)_2C_6H_3OAg$ treated with MeI or EtI also gave (*c*) and (*d*). No solvent can be used in the latter reaction and a large excess of MeI or EtI must be used to prevent explosions. (*c*) and (*d*) treated with NH_3-EtOH some days in the cold or a few hrs. at 100° gave (*a*) quant., lemon-yellow, flat needles, m. 213°, little sol. in org. solvents. 19 g. of (*a*) suspended in 35 g. HNO_3 (d. 1.4) at 0° was treated with a current of N_2O_3 until all (*a*) was dissolved in the green soln.; a current of air was then passed until the N_2O_3 was removed; $Me(O_2N)_2C_6H_2N_2NO_3$ (*e*) was pptd. The paste was poured on 3–4 kg. of crushed ice and treated with 60 g. $NaNO_2$ in 500 cc. H_2O which pptd. (*e*) and evolved N_2. The tarry product was washed with H_2O and dissolved in warm HNO_3 (d. 1.4) from which (*e*) crystd. in nearly white crystals m. 97.2°. Crystd. from Et_2O-EtOH, crystals of the rhombic system, bipyramidal system, with $a:b:c = 0.6363:1:0.3725$, were obtained. Trinitrotoluene (*δ*) gives crystals of the monoclinic system and prismatic class: $a:b:c = 1.4275:1:0.9176$, $\beta = 58° 36'$. With NH_3-EtOH in the cold (*e*) gives back (*a*). 10 g. (*e*) suspended in 500 g. concd. H_2SO_4 warmed to 50° and treated gradually with 14 g. CrO_3, poured into ice, cooled and extd. with Et_2O gave the corresponding $(O_2N)_2C_6H_2CO_2H$ (*f*), crystd. from H_2O at 65–70° as rhombic plates containing 2 H_2O, m. 82°, anhydrous acid, m. 171°; boiled with H_2O it loses the *o*-NO_2 group to give the $HO(O_2N)_2C_6H_2CO_2H$, m. 166°. (*f*) with abs. MeOH in the sealed tube at 125° replaces the *o*-NO_2 with OMe to give *3,5-dinitro-2-methyoxybenzoic acid*, tabular crystals, m. 132°. Treated with NH_3-EtOH (*f*) gives 2,3,5-$H_2N(O_2N)_2C_6H_2CO_2NH_4$ (free acid, m. 256°); with aq. NH_3 the preceding mixed with $HO(O_2N)_2C_6H_2CO_2NH_4$ was obtained. (*e*) treated with $CuCl_2$ in H_2O in the presence of much ice evolves N_2 and gives a ppt., which washed, distd. with steam and crystd. from EtOH, gives *3,5-dinitro-2-chlorotoluene*, large prisms, m. 65°. *3,5-Dinitro-2-iodotoluene*, lemon-yellow tablets from Et_2O-EtOH, m. 119.5°, was obtained similarly with KI. *3,5-Dinitro-2-bromotoluene*, large, yellow prisms from EtOH, m. 95°, was obtained similarly with $CuBr_2$. A sixth $(O_2N)_3C_6H_2Me$ will be described in another paper. E. J. Witzemann.

Some derivatives of lapacic acid. Lydia Monti. Univ. Rome. *Atti accad. Lincei* **24**, I, 1058–64(1915); *Gass. chim. ital.* **45**, II, 51–9(1915).—Lapacic acid (*a*) is a yellow substance contained in lapacho or taigu (a *bigoniacea* that grows in S. America) and in other varieties of wood. Paternò (*Gass. chim. ital.* **12**, 337(1882)) detd. its compn. as $C_{15}H_{14}O_3$ and attributed the formula (I) to it. M. has now studied the re-



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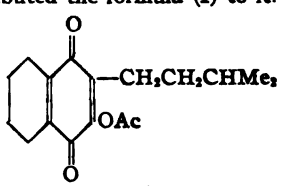

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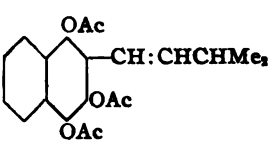

(III)

duction of this acid. (*a*) in EtOH in the presence of Pd black adds 2 atoms of H and is transformed into the corresponding quinol which in the air is reoxidized to give again the quinone (*a*). The amylene group is not reduced owing, perhaps, to the negative influence of the phenolic OH. When this OH is converted into the mono-Ac deriv., $C_{17}H_{16}O_4$, 4 atoms of H are absorbed, *i. e.*, the amylene group is reduced to Am with 2 atoms of H and a canary-yellow compd., $C_{17}H_{18}O_4$, m. 74–5°, was sepd. and ought to have the formula (II). The 2 H atoms are lost by oxidation on exposure to the air. On sapon. with aq. KOH the *dihydrolapacic acid* corresponding to (II), yellow needles from dil. EtOH, m. 87–9°, was obtained. 1 g. (*a*) in 20 cc. Ac_2O + 1 g. Zn heated, filtered and the filtrate decompd. with H_2O, sepd. a yellow oil which crystd. from EtOH

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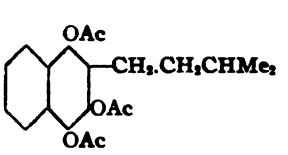
as white needles, m. 138–40°, a compd., $C_{21}H_{32}O_6$, which is identical with the tri-Ac deriv. of hydrolapacic acid (III) obtained by P. and Minunni (*Gazz. chim. ital.* **19**, 601(1899)) by the action of Ac_2O on the reduction product obtained by treating (*a*) with Zn + KOH in the absence of air. The mono-Ac deriv. of (*a*) similarly treated gives the same compd. By this method of reduction the amylene group remains unchanged. (III) with Pd black absorbs 2 H atoms and gives white needles, m. 110–2°, of $C_{21}H_{34}O_6$ or the *triacetyltetrahydrolapacic acid* (IV). The acid corresponding to



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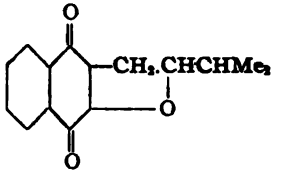

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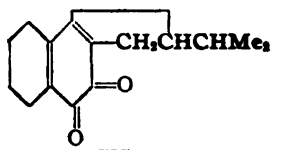
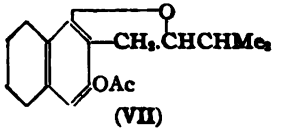
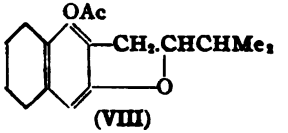


(VI)

(IV) could not be isolated since it is oxidized at once to the corresponding quinone deriv. so that *dihydrolapacic acid* is formed instead. P. noted that H_2SO_4 acts on (*a*) to give an orange-red isomer, m. 156°, which he called lapacone. With HNO_3 besides lapacone another yellow substance was formed. Hooker (*J. Chem. Soc.* **61**, 611(1892)) treated (*a*) with a mixt. of HOAc + HCl and obtained a yellow isomer, m. 116–7°. In order to explain the formation of the 2 isomers H. assumed that one is a deriv. of α-naphthoquinone called α-lapacone (V) and the 2nd is a deriv. of β-naphthoquinone called β-lapacone (VI). M. repeated these expts. and found that the nature of the mineral acid does not specifically affect the formation of one or the other, but that it is a question of the temp. used. In hot H_2SO_4 the α-deriv. is formed and in cold H_2SO_4 the β-deriv. but generally a mixt. is obtained. In EtOH soln. (V) and (VI) in the presence of Pd black absorb 2 atoms of H and the discolored product in contact with the air or on distg. off the EtOH gives back the original (V) and (VI), which behavior agrees well with the constitution given, *i. e.*, the hydroquinones are reoxidized in the air. (VI) boiled with Ac_2O + Zn gives $C_{19}H_{20}O_5$, white needles, m. 160–2°, identical with diacetylhydro-β-lapacone obtained by P. and M. by the action of Ac_2O on the product of the action of Na + EtOH on (VI), the formula of which is (VII).



(VII)



(VIII)

(V), m. 116–7°, treated similarly gives a cryst. product of white needles, m. 170–2°, of *diacetylhydro-α-lapacone* (VIII). P. found that heating (*a*) with Ac_2O + NaOAc a few mins. gave the *monoacetyl derivative* (*b*), m. 81°; heating 15 min. gave a different compd., m. 131–2°, $C_{18}H_{12}O(OAc)_2$, of which the constitution is obscure. Reduction of (*b*) with Ac_2O + Zn gave a negative result; (*b*) was recovered unchanged. Treatment with H + Pd black caused the absorption of 2 atoms of H, and gave $C_{19}H_{20}O_5$, white needles, m. 170–2°, identical with (VIII). E. J. W.

Rotatory dispersion of potassium iridio-oxalate. GEORGE BRUHAT. *Bull. soc. chim.* **17**, 223–7(1915).—Abnormal rotatory dispersion and circular dichroism were noted in the case of yellow $K_3Ir(C_2O_4)_3.2H_2O$ (*A*) solns., which show complete absorption in the violet end of the visible spectrum. Data and curves indicating rotations and ellipticities of (*A*) are given. Rotatory dispersion, rizing in the yellow and green, reaches its max. in the blue and is nullified in the violet portion of the visible spectrum. Dichroism on the other hand is negligible in the red and yellow portions and reaches

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its max. in the region where the rotatory dispersion approaches zero. The max. ellipticity is roughly twice as great as the max. rotation. LOUIS E. WISE.

Preparation of acetylenic nitriles and of 1-halogenated acetylene derivatives. V. GRIGNARD AND C. COURTOT. Inst. chim., Nancy. *Bull. soc. chim.* **17**, 228–31 (1915).—$Me(CH_2)_4C:CMgBr$, formed by the action of heptine on EtMgBr, when gradually added to ClCN in Et_2O, at 0°, and the product hydrolyzed with cold H_2O, gave rise to $Me(CH_2)_4C:CCN$, b_{744} 191–2°, in 67% yield. A similar reaction between $PhC:CMgBr$ (*A*) and ClCN or $(CN)_2$ led to the formation of $PhC:CCN$, b_{17} 105–7°, m. 38–40°, in 61% yield, besides smaller amts. of $PhC:CCl$ and $PhC:CH$ (cf. *Bull. soc. chim.* **1901**, 99). If, however, (*A*) is treated with BrCN instead of ClCN under the same conditions, an 80% yield of $PhC:CBr$, b_{16} 95–7°, is formed (cf. Nef, *Ann.* **308**, 311(1899)). The reaction between $(CN)_2$ and $(:CMgBr)_2$ appeared to proceed normally, but the reaction mixt. yielded only C_2H_2 instead of the expected $(NC.C:)_2$ on hydrolysis. LOUIS E. WISE.

Basic copper salicylate. W. OECHSNER DE CONINCK. Inst. chim. gén., Montpellier. *Bull. soc. chim.* **17**, 232–4(1915); cf. *C. A.* **9**, 2227.—$(o\text{-}HOC_6H_4CO_2)_2Cu.4H_2O$ (*A*) when shaken with a large excess of Et_2O yielded a *basic copper salicylate*, $O.C_6H_4.CO.O.Cu.H_2O$ (*B*), green needles with yellowish reflex, from H_2O, also obtained (but in smaller yield) by the action of hot H_2O on (*A*). On heating, (*B*) is decompd. into CuO, PhOH and CO_2. The action upon (*B*) of a number of mineral and org. acids, bases and salts is described. LOUIS E. WISE.

Alkaloids of the calabar bean. I. Eserine. MAX POLONOVSKI. *Bull. soc. chim.* **17**, 235–44(1915); cf. *Ibid* **1893**, 1008.—Eserine (*A*), $C_{15}H_{21}O_2N_3$, forms a *methiodide*, powder, m. 120–5° (decompn.). The *sulfite* of (*A*), cryst. powder, m. 106° (decompn.) (supposed by Böhringer to be a free base; ref. not given), has $[\alpha]_D$ 20° in H_2O, increasing rapidly when a current of SO_2 is passed through the aq. soln. until $[\alpha]_D$ 87.6° is reached. On evapg. this soln. to dryness, the sulfite was probably oxidized in part to the sulfate, whose aq. soln. showed $[\alpha]_D$ —93.9°, soon reaching the original max. *d*-rotation (87.6°) when treated again with SO_2. Similarly the $[\alpha]_D$ of the pure (*A*) *sulfate* in H_2O, originally —130°, rose rapidly to 103°, when the soln. was treated with SO_2, but fell to the original —130°, after the complete expulsion of the SO_2. The presence of one CONHMe linkage in (*A*) was demonstrated by the following expts.: (*a*) 1 mol. of (*A*) when heated with aq. $Ba(OH)_2$ yielded 1 mol. of CO_2 as carbonate and 1 mol. of $MeNH_2$; (*b*) on heating (*A*) at 150–60°, or by oxidizing the sulfate of (*A*) with 4% $KMnO_4$, CO:NMe is formed (cf. Ehrenberg, *Verh. Ges. Deutsch. Naturforscher Ärzte* **11**, 102(1892)). (*A*) in abs. alc. when heated with EtONa in the absence of air, yielded $MeNHCO_2Et$, b. 169–70°, and eseroline (*B*), $C_{13}H_{18}ON_2$, m. 129°, $[\alpha]_D$ in abs. alc. —107° (cf. Salway, *C. A.* **6**, 792); picrate, orange needles, m. 190° (probably dimorphous; cf. Straus, *C. A.* **8**, 498, who has described another picrate of (*B*), m. 167°); *hydrochloride*, m. 212–3°; *hydrobromide*, H_2O, after dehydration, m. 208°; *sulfate*, m. 202–3°, $[\alpha]_D$ —164° in H_2O; methiodide, prisms, m. 188° (Straus gives 187–8°; Salway gives 196°). $MeC_6H_4SO_2Et$ in EtOH reacting gradually with (*A*) in EtOH in the presence of EtONa gave rise to *eserethole*, $C_{13}H_{17}N_2OEt$ (*C*) (the Et ether of (*B*)), b. 308–10° (slight decompn.), $[\alpha]_D$ in EtOH —81°, strongly alk.: *hydrobromide*, prisms, m. 178°; *picrate*, yellow, m. 133°. (*C*) was also formed by heating (*A*) with EtBr and EtONa or, in much more satisfactory yield, by treating (*B*) with $MeC_6H_4SO_2Et$ in the presence of EtONa. The *methiodide* of (*C*), leaflets, m. 171°, when treated with alkalies forms a base, m. 80°, not further characterized. It is evident from the above reactions that (*B*) contains an OH group. When treated with CO:NMe, (*B*) appears to form an *isomer* of (*A*), m. 195–6°, which also gives rise to

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CO_2 and $MeNH_2$, when decompd. with aq. $Ba(OH)_2$. (*B*) and CO:NPh yield a compd., m. 184°, and an oil. These incomplete expts. are being continued. **II. Geneserine, a new alkaloid.** With CHARLES NITZBERG. *Ibid* 244–56.—When pulverized calabar beans were treated with $NaHCO_3$ and extd. with cold Et_2O, the Et_2O exts. shaken with dil. H_2SO_4, the soln. neutralized with $NaHCO_3$ and this soln. extd. with Et_2O, an oil was obtained which partially crystd. with the sepn. of a new alkaloid, *geneserine* (*D*), $C_{15}H_{22}O_2N_2$, orthogonal crystals, m. 128–9°. The remaining portion of the oil contained eserine (*A*), readily sepd. as the salicylate. When the extn. of calabar beans was carried out using hot Na_2CO_3 soln. and boiling Et_2O an increased yield of (*D*) was obtained. The max. yield (0.1%) of (*D*), free from (*A*), was obtained when the plant was heated with 2% aq. NaOH and extd. with Et_2O. Extn. with tartaric acid and EtOH on the other hand yielded solely (*A*). (*D*), faintly basic, $[\alpha]_D$ in EtOH —175°, in dil. H_2SO_4 —188°, yielded the following derivs.: *salicylate*, m. 89–90°; *picrate*, straw-colored needles, m. 175°; *methiodide*, fine needles, m. 215°, forming a very basic Et_2O-sol. compd. (not further characterized) when treated with K_2CO_3. When heated to 160°, (*D*) decompd., giving rise to CO:NMe, which was also formed when (*D*) was oxidized with acid $KMnO_4$ or CrO_3. (*D*) acts as a powerful reducing agent towards $AgNO_3$, and adds Br and I with the formation of the corresponding perhalides. When heated with aq. $Ba(OH)_2$, (*D*) yields 1 mol. of CO_2 and 1 mol. of $MeNH_2$, indicating the presence of one CONHMe group in the mol. When treated with EtONa, (*D*) in the absence of air undergoes decompn., giving rise to $MeNHCO_2Et$ and *geneseroline* (*E*), $C_{13}H_{18}O_2N_2$, m. 150°, $[\alpha]_D$ in alc. —176°, in dil. H_2SO_4 —230°. The following derivs. of (*E*) are described: *picrate*, orange-red, m. 175°; *hydrobromide*, m. 208°; *hydrochloride*, H_2O, m. 154° after dehydration; *normal sulfate*, decomps. 160°; *acid sulfate*, prismatic needles, m. 183–4° (decompn.). Treatment of (*D*) in EtOH with $MeC_6H_4SO_2Et$ in the presence of EtONa gave rise to an ether, *geneserethole* (*F*), leaflets, m. 83°, $[\alpha]_D$ in alc. —182°; *hydriodide*, H_2O, silky needles, m. 108°; *hydrochloride*, m. 120–4°. (*F*) was shown to be the Et ether of (*E*), from which it was obtained by etherification with EtBr and EtONa. The etherification of (*E*) with $MeC_6H_4SO_2Et$, however, led to the formation of very small amts. of (*F*), together with much larger quantities of eserethole (*C*). (*D*) in EtOH acidified with AcOH when heated under reflux with powdered Zn yielded (*A*). A similar result was obtained when SO_2 was used as reducing agent. Reduction of (*D*) by means of Zn and H_2SO_4 yielded a different unidentified product, $[\alpha]_D$ —54°. The reduction of (*E*) in acidulated EtOH by means of Zn dust led to the formation of eseroline (*B*). Reduction of (*E*) with SO_2 gave rise to (*B*) as well as to an important by-product, a *sulfo derivative*, $C_{13}H_{17}ON_2SO_2H$, m. 235°, $[\alpha]_D$ —100°. (*F*) upon reduction was converted into (*C*) both by means of Zn and by SO_2. The base physovenine prepd. by Salway is not identical with (*D*), since it has a much greater miotic action than (*A*), whereas (*D*) is practically inactive. A table giving the principal properties of (*A*) and (*D*) and of their corresponding derivs. brings out the striking analogies between these compds. **III. Action of sulfur dioxide upon eserine, geneserine and their derivatives.** With CHARLES NITZBERG. *Ibid* 290–7.—The action of SO_2 on eserine (*A*) has been previously described. Eseroline (*B*) in aq. suspension, when treated with a current of SO_2, dissolves with the formation of a bright yellow soln. (*B*) in H_2SO_4, $[\alpha]_D$ —164°, when treated with SO_2 in excess yields a sulfite soln., $[\alpha]_D$ —16°, returning to the original $[\alpha]$ —164° after the complete expulsion of SO_2. Eserethole (*C*) behaves similarly and apparently forms an unstable sulfite soln. when treated with SO_2. The action of SO_2 on geneserine (*D*) led to the partial reduction of (*D*) with the formation of (*A*), besides giving rise to other unidentified products. The $[\alpha]_D$ of (*D*) in aq. H_2SO_4, —188°, rises to approximately 30°, when the soln. is treated with SO_2, and drops to —116° when the gas is expelled. SO_2 acting upon (*D*) in $CHCl_3$.

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or PhH gave rise to a mixt. of the sulfate of (*A*) and *eserinesulfonic acid*, $(C_{15}H_{20}O_2N_2)SO_2H$, microprisms, m. 174°, $[\alpha]_D$ in H_2O —426°, rising to —140° when treated with SO_2, and falling to —426° after expulsion of the gas. Geneseroline (*E*) suspended in H_2O dissolves when treated with SO_2, forming (*B*) and *eserolinesulfonic acid* $(C_{12}H_{17}ON_2)SO_2H.2H_2O$, m. 235°, $[\alpha]_D$ —100° changing to 20° when treated with SO_2. The $[\alpha]_D$ of (*E*) in H_2SO_4, —228°, rises to —130° when treated with SO_2 and falls to —160° after expulsion of SO_2. SO_2 also causes the partial reduction of geneserethole to (*C*). Here the original $[\alpha]_D$ —182° changes to —87° when the soln. is satd. with SO_2 and to —146° when the gas is removed. A sulfonic acid was probably formed in this case, as well. LOUIS E. WISE.

A new copper derivative of glycocoll. J. VILLE. *Bull. soc. chim.* 17, 315–8(1915). —Upon adding alc. to an aq. mixt. of 2 mols. of glycine and 1 mol. of $CuSO_4$, an *addition product* (*A*), probably a *copper glycine sulfate*, $Cu(O.CO.CH_2NH_2)H_2SO_4$, sepd. in the form of a heavy, blue, hygroscopic liquid, which formed a resin when dried at 120–5°. (*A*) was also prepd. by adding 1 mol. of $Cu(OH)_2$ to 1 mol. of $(HO_2C.CH_2.NH_2)H_2SO_4$ with the subsequent addition of alc. (*A*) is decompd. by alkali with the formation of $(H_2NCH_2CO_2)_2Cu$. LOUIS E. WISE.

Nitration of diethyl-*m*-phenetidine. FRÉDÉRIC REVERDIN. *Bull. soc. chim.* 17, 278–82(1915); cf. *C. A.* 9, 2228.—*Diethyl-m-phenetidine* (*A*), *m*-$EtC_6H_4NEt_2$, b. 286°, was formed by the interaction of *m*-$EtOC_6H_4NH_2$ and EtBr. The *4,6-dinitro derivative* (*B*) of (*A*), 3,4,6-$(Et_2N)(O_2N)_2C_6H_2OEt$, yellow needles or prisms, m. 94°, was obtained by treating (*A*) in ice-cold glacial AcOH with HNO_3 (d. 1.52). Further nitration of (*B*) in Ac_2O with HNO_3 (d. 1.52) yielded *4,6-dinitro-3-ethylnitramino-1-ethoxybenzene* (*C*), needles from ligroin, m. 112°. If HNO_3 (d. 1.4) and (*A*) are allowed to interact, *4,6-dinitro-3-monoethylamino-1-ethoxybenzene* (*D*), yellow needles, m. 134°, is formed together with a compd., m. 75°, isolated from the mother liquors of (*D*), probably a NO deriv. Alc. KOH acting upon (*C*) gave rise to *4,6-dinitro-3-ethylamino-1-phenol*, yellow needles, m. 128–9°, isolated by means of its *barium derivative*, fine needles. LOUIS E. WISE.

Acetyl derivatives of diphenylthiosemicarbazides. JAMES L. MCKEE. Univ. Coll., Cork. *J. Chem. Soc.* 107, 1133–44(1915).—In the following compds. the position of the substituted groups is indicated by the letters *a*, *b* and *c*, according to the scheme: $\underset{a}{NH_2}.CS.\underset{b}{NH}.\underset{c}{NH_2}$. When 10 g. of finely powdered NHPh.CS.NH.NHPh in 20 cc. of PhH were treated with 6 cc. of AcCl, an *addition product*, PhNH.CS(AcCl)-NHNHPh (*A*), m. 233° (with evolution of HCl), was formed. (*A*) behaves like the salt of a moderately strong base, is desulfurized by alk. Pb solns., and in aq. soln. yields white ppts. with aq. iodides, nitrates, thiosulfates, thiocyanates, and phosphates, and yellow ppts. with K_2CrO_4 and picric acid, but no ppt. with sulfates or bromides. The *nitrate*, PhNHCS(AcNO$_3$)NHNHPh, crystals, m. 173°; the corresponding *picrate*, yellow, m. 175°. When warmed on a steam bath with 100 g. H_2O, (*A*) forms *c-acetyl-ac-diphenylthiosemicarbazide* (*B*), PhNHCSNHNAcPh, m. (when plunged into a hot m. p. bath) 160°, resolidifying and rem. 261°. (*B*), which possesses no basic properties, and is desulfurized by NH_3-$AgNO_3$, but not by alk. Pb solns., was also prepd. by shaking finely powdered (*A*) with the exact equiv. of cold, dil., aq. Na_2CO_3; or by the interaction of PhNCS and $PhNAcNH_2$. This synthesis proves the structure of (*B*). All of the properties of (*A*) indicate that it belongs to the group of additive compds., formed from thiocarbamides and AcCl (cf. Dixon and Taylor, *C. A.* 7, 1354). When (*B*) is heated at 130° or *when boiled with H_2O*, dehydration takes place with the formation of an *anhydride* (*C*) of (*B*), $C_{15}H_{12}N_2S$, needles, m. 265° (cf. 2nd m. p. of (*B*) above)). When m. p. tubes containing pure (*C*) were plunged directly into hot acid (*C*) sintered

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at 230° and m. (for a moment only) 234°. McK. suggests that a reversible change in (*C*) taking place at 230–4° is possibly due to a conversion of the thiocarbamidic into the tautomeric *iso*-form or *vice versa*. (*C*) could also be prepd. by fusing (*A*), but was most conveniently formed by heating PhNHCSNHNHPh with Ac_2O on a H_2O bath. This reaction yielded as a by-product PhNHCSNPhNHAc (*D*), m. 133° (cf. Vahle, *Ber.* **27**, 1513(1894)). The constitution of (*C*) is uncertain, any of the following formulas being possible: SC.NH.NPh.C(:CH_2).NPh, PhNHCSN.NPh.C:CH_2 PhN:C.NH.NPh.C(:CH_2).S, or PhNHC:N.NPh.C(:CH_2).S. (*D*) was also formed by heating (*A*) on the H_2O bath with an excess of alc. KOH. When PhNHCSNPhNH$_2$ (*F*) was heated with Ac_2O (or less readily when (*F*) suspended in PhH was treated with AcCl), (*D*) was obtained. When (*F*) suspended in acetone was treated with AcCl and the product poured into aq. KOH, *a-acetyl-ac-diphenylthiosemicarbaside* (*G*), prisms, m. 161–2°, was obtained. (*G*) when boiled with EtOH and $FeCl_3$ gave a blood-red color, bleached by HCl. In no case was an AcCl addition product of (*F*) obtained. When boiled with 20% H_2SO_4 or HCl (*G*) formed PhNCS and PhNHNH$_2$ (or its Ac deriv.) which indicates that the above structure is probably correct. (PhNH)$_2$ and AcNCS in PhH reacted to form *a-acetyl-bc-diphenylthiosemicarbaside*, m. 272.5°, which gave with $FeCl_3$ a blood-red color unchanged by the addition of HCl.

LOUIS E. WISE.

Resolution of externally compensated tetrahydro-β-naphthaquinaldine into its optically active components. CHARLES S. GIBSON AND JOHN L. SIMONSEN. Maharaja's Coll., Travancore, and Presidency Coll., Madras. *J. Chem. Soc.* **107**, 1148–59(1915). —*dl*-Tetrahydro-β-naphthaquinaldine (*A*), prisms, m. 49–50° (cf. Bamberger and Müller, *Ber.* **24**, 2646(1891)); *picrate*, 2 H_2O, yellow needles, m. 100–1°, was most readily prepd. by the following method: To the boiling soln. of 40 g. (*A*) in 2 *N* H_2SO_4 (containing 16.2 g. H_2SO_4) were added 33 g. of NH_4 *d*-α-bromocamphor-π-sulfonate. An oil sepd., crystd. and after fractional crystn. yielded fractions varying in $[\alpha]_{5461}$ from 54° to 134.7°. The fraction of highest $[\alpha]$ was shown to be *d-tetrahydro-β-naphthaquinaldine d-α-bromocamphor-π-sulfonate* (*B*), thin plates, m. 240° (with slight preliminary decompn. at 233°). The filtrate from (*B*) was treated with NaOH, extd. with PhH, the PhH ext. washed with H_2O, dried with KOH, shaken with 8.2 g. H_2SO_4 (in 2 *N* soln.), and the PhH sepd. The H_2SO_4 soln. was heated almost to boiling, and a hot aq. soln. of 28 g. NH_4 *l*-α-bromocamphor-π-sulfonate added. A product sepd. which after fractional crystn. yielded pure *l-tetrahydro-β-naphthaquinaldine l-α-bromocamphor-π-sulfonate* (*C*), plates, m. 240°, $[\alpha]_{5461}$ —134.5°. The *d-α-bromo-π-sulfonate*, isomeric with (*C*), long needles, m. 240° (decompn.), $[\alpha]_{5461}$ 20.6°, was formed by decompg. (*C*) with alkali and adding an equiv. amt. of the *d*-acid to the well-washed free base. *d-Tetrahydro-β-naphthaquinaldine* (*D*), m. 54.6°, $[\alpha]_{5461}$ in abs. alc. 108.96°, in PhH 157°, was prepd. by grinding (*B*) with filtered aq. NaOH and crystg. the product from MeOH or petroleum. Similarly (*C*) yielded the *l-isomer* (*E*), m. 54.6°, $[\alpha]_{5461}$ in abs. alc. —108.5°. The *chloroplatinate* of (*D*), orange-red microcryst. powder, decomps. 200°. *Benzoyl derivative* of (*D*), needles, m. 198–9°, $[\alpha]_{5461}$ —587°. The *benzoyl derivative* of (*E*), needles, m. 198–9°, $[\alpha]_{5461}$ 587.6°. (A similar change of sign was observed on benzoylating other active bases (cf. Pope and Peachey, *Ibid* **75**, 1066(1899) *et al.*). A quant. yield of *dl-tetrahydro-β-naphthaquinaldino-d-methylenecamphor* (*G*), OC.C_8H_{14}.C:CHN.$C_{10}H_6(CH_2)_2$.CHMe, thin plates, m. 182–3°, $[\alpha]_{5461}$ in EtOH, 413°, was obtained by condensing α-hydroxymethylenecamphor (*F*) with (*A*). No resolution of (*G*) could be effected by fractional crystn. No mutarotation of (*G*) in EtOH or PhH was observed, but (*G*) in AcOH exhibited mutarotation, solns. reaching a const. minimum

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value ($[\alpha]_{5461}$ 415°) in about 3 hrs. The *hydrobromide* of (*A*) was prepd. by treating (*G*) with Br and EtOH. Its fluorescent solns. are optically inactive, giving further evidence that (*A*) had not been resolved by means of (*F*). LOUIS E. WISE.

Rotatory dispersive power of organic compounds. VI. Complex rotatory dispersion of ethyl tartrate. THOMAS M. LOWRY AND THOMAS W. DICKSON. London. *J. Chem. Soc.* **107**, 1173–87(1915); cf. *C. A.* 8, 1569, 2105.—The rotatory power of Et tartrate alone and in a large number of solvents has been measured, using many different sources of monochromatic light. L. and D. find no evidence that simple *d*- or *l*-rotation is present under any of the conditions studied (cf. Winther, *Z. physik. Chem.* **41**, 161 (1902)). L. and D. found great difficulty in obtaining pure Et tartrate, which after repeated fractionation yielded a product (*A*), $[\alpha]_{5461}$ approx. 55° (measured in a 6 diam. tube). (*A*) shows no mutarotation when freshly distd., when heated and cooled, or when dissolved in $HCONH_2$ or $C_2H_4Br_2$. The $[\alpha]$ of (*A*) was detd. at 20° in the following solvents (in many cases in several concns.): $HCONH_2$, $PhNO_2$, H_2O, acetone, allyl alc., $CHBr_3$, CCl_4, $C_2H_4Cl_2$, $C_2H_4Br_2$(?), $(Br_2CH)_2$, $C_2H_4Br_2$ and $(Cl_2CH)_2$. In this series in which Li (6708), Na, Hg (5780, 5461 and 4358) lights were used, it was possible (by proper use of solvent and concn.) to follow the dispersion curve of (*A*) to the point at which the sign of rotation became reversed. In another series, $[\alpha]$ of (*A*) alone at 20°, 64.3°, and 98.7° and in $HCONH_2$ and $C_2H_4Br_2$ (25 g. in 100 cc.) were detd. for Cd (6438, 5186 and 4800) and Fe (4271, 4261, 4251, 4191, *et al.*), besides the wave lengths listed above. Both the visible and photographic methods of measurement were used, the latter yielding dispersion data in the region $\lambda < 4358$, where the spectrum becomes practically invisible. The values calcd. from the Drude equation: $\alpha = \left(k_1/(\lambda^2 - \lambda_1^2)\right) - \left(k_2/(\lambda^2 - \lambda_2^2)\right)$ (cf. *C. A.* 7, 3316) and the observed values for $[\alpha]$ show very good agreement. Most of the data (which are given completely in a series of tables) were reproduced in the form of dispersion curves, which are discussed in detail. In spite of the apparent complexities of the curves and the questionable purity of (*A*), the rotatory dispersion of (*A*) may be expressed as the sum of 2 simple dispersions of unequal magnitude and opposite sign. **VII. Complex rotatory dispersion of methyl tartrate.** With HAROLD H. ABRAM. *Ibid* 1187–95.—The uncertain character of Et tartrate (*A*) and the difficulty in prepg. a homogeneous ester led to the use of the solid Me ester (*B*), which was readily obtained in the pure state, as shown by preliminary polarimetric readings. The dispersion curves of (*B*) are of the same general type as those of (*A*), but the *d*-rotations are < those of (*A*), and pass more readily into *l*-rotation at the violet end of the spectrum. Mutarotation expts. with (*B*) as in the case of (*A*) gave negative results. The $[\alpha]$ of (*B*) at 20° and 100.5°, and of (*B*) in $C_2H_4Cl_2$, $HCONH_2$, acetone, H_2O, C_5H_5N, and quinoline for a large number of pure monochromatic lights of different λ (ranging in some cases from Li 6708 to Fe 3750) were detd. Excellent agreement between observed and calcd. $[\alpha]$ was noted. Dispersion curves were plotted from tabulated data. The complex dispersion of (*B*) may be accurately expressed as the sum of 2 simple dispersions. **VIII. An exact definition of normal and anomalous rotatory dispersion.** T. M. LOWRY. *Ibid* 1195–1202.—A criticism of the older loose definitions of "normal" and "anomalous" dispersion (especially those of Winther) which were the result of a lack of knowledge of the mathematical form of the dispersion curves. Assuming the validity of Drude's equation (cf. VI), which adequately meets the requirements of all exptl. observations of rotatory dispersion, L. develops definitions, which retain the essential ideas of normal and anomalous dispersion and are at the same time capable of exact mathematical interpretation. By the use of a rough average of actual values for a large number of tartaric acid derivs., and making the Σ rotation consts. = 1, L. has calcd. a complete "family of curves," showing all the chief types of dispersion: simple, complex, normal and anomalous.

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All curves of the Drude type become asymptotic to a horizontal axis of 0° rotation when $\lambda = \infty$, and asymptotic to a vertical axis when $\lambda^2 = \lambda_n^2$ (where λ_n^2 = largest of the dispersion consts.). If the dispersion is "*simple*," the curve is a rectangular hyperbola lying in the angle between these asymptotes and is always *normal*. If the dispersion is *complex*, but the terms of Drude's equation are of the same sign, the curve, although no longer a rectangular hyperbola, has very much of the same general appearance and lies wholly in the angle between the 2 asymptotes, running without reversal of curvature from the horizontal to the vertical asymptote. This curve is also *normal*. If the dispersion is *complex* and the 2 terms of Drude's equation are of opposite sign, the dispersion curve may lie wholly on 1 side of the axis and be *normal*, or may cross the axis, show a reversal of sign and manifest all the characteristic anomalies at some portion of the spectrum. The limiting condition for anomalous dispersion in the case of a 2-term (Drude) formula is that the term with the smaller dispersion const. must have the larger rotation const., and *vice versa*. *Anomalous curves* may be recognized by the occurrence of an inflexion, a max. or reversal of sign or even by the fact that the curvature viewed from 1 of the asymptotes is concave instead of convex in some part of the curve. LOUIS E. WISE.

Solubility of nitrophenols and other isomeric disubstitution products of benzene. NEVIL V. SIDGWICK, WILLIAM J. SPURRELL AND THOMAS E. DAVIES. Oxford. *J. Chem. Soc.* 107, 1202–13(1915).—In the hope of throwing some light on the structure of *o*-, *m*- and *p*-$O_2NC_6H_4OH$, S., S. and D. have made a quant. study of the solubility of these compds. in H_2O. The solubility curves have been drawn and compared with those of the 3 cresols and the 3 toluic acids (these compds. being chosen because they are typical position isomerides). The physical behavior in the case of the cresols and toluic acids is normal, the 3 solubility curves ("liquid-liquid" curves) in each set running very close to one another and the critical soln. temp. never differing by more than 20°. The only considerable differences noted (in the case of the toluic acids) were in the points at which the "solid-liquid" curves branch off from the "liquid-liquid" curves, *i. e.*, no appreciable differences in solubility due to orientation were noted when these isomerides were in the *liquid* state. The *m*- and *p*-$O_2NC_6H_4OH$ follow the same rule and give very similar solubility curves (with critical soln. temps. within 7° of each other), but the *solubility of the o-compd.* (*A*) *in* H_2O *is never more than 0.1 that of the other 2 compds.* Even at 100°, its solubility is < 10% and its critical soln. temp. (which could not be detd.) is well above 200°. The anomalous behavior of (*A*) is all the more exaggerated by the fact that its vapor pressure is much > that of the *p*-compd. S., S. and D. conclude that while the *m*- and *p*-compds. possess a similar structure, the physical behavior exhibited by (*A*) must be due to some marked structural difference. The theories of Hantzsch and Gorke (*Ber.* 39, 1093(1906)) are critically discussed. The solubilities of (*A*), *p*- and *m*-$O_2NC_6H_4OH$ in PhMe, PhBr, and $C_2H_4Br_2$ were also detd. In the cases in which PhMe was used as solvent, the curves were drawn, but since the whole position of the curves was dominated by the m. ps. of the pure solutes, the anomalous behavior of (*A*) was never apparent. Full tabulated data are given. LOUIS E. WISE.

Syntheses in the fluorene and bisdiphenylene-ethylene series. GONZALO GALLAS. *Anales soc. españ. fis. quim.* 12, 112–31(1914); *J. Chem. Soc.* 106, I, 1169.—2,7-Dinitrofluorenone condenses with 2,7-dinitrofluorene at 160° in the presence of $ZnCl_2$ to form 2,7,2′,7′-tetranitrobisdiphenylene-ethylene, which on reduction by means of Sn and HCl yields the corresponding *tetraamino compound*, colorless, silky needles, m. 250° (decompn.). The acid soln. develops a blue color with oxidizing agents. H. S. PAINE.

Synthesis of a benzoylated alkamine of the camphor group. ANTONIO MADINAVEITIA. Madrid. *Anales soc. españ. fis. quim.* 12, 428–32(1914).—M. attempted to

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obtain a compd. with the peculiar properties of the anesthetics of the stovaine group as well as those of derivs. of the camphor nucleus. Dimethylaminocamphor was obtained from camphor by the Duden and Pritzkov procedure with the exception that the aminocamphor was methylated with Me_2SO_4 instead of MeI. To 3.8 g. Mg powder in 16 g. EtBr and 100 cc. Et_2O were added 9 g. dimethylaminocamphor dild. with 20 cc. Et_2O. After 12 hrs. in an ice box, ice H_2O was added and the Et_2O layer was sepd. and dried with K_2CO_3; distn. of the residue after evapn. of the Et_2O resulted in a yield of 6.5 g. *dimethylaminoethylborneol*, b. 134–5°, an oil with pronounced odor, sol. in alc., Et_2O and C_6H_6, slightly sol. in petr. ether and insol. in H_2O, gives the Denigès reaction for tertiary alcs.; the *picrate*, well-formed crystals from EtOH, m. 208°, was produced when Et_2O solns. of the base and picric acid were mixed. *Benzoyl-α-dimethylaminoethylborneol hydrochloride*, cryst., sol. in EtOH, insol. in Et_2O and extremely sol. in H_2O; it is pptd. in aq. soln. by $AgNO_3$ and fixed alkalies. It dissolves in the cold in H_2SO_4 with evolution of HCl (the soln. becomes dark on heating); the characteristic odor of BzOMe is observed after cooling, adding several drops MeOH and dilg. with H_2O.

H. S. PAINE.

Bismuth salts of halogenated derivatives of gallic acid. P. LAMI. *Boll. chim. farm.* 54, 2–5(1914).—*Basic bismuth dichlorogallate*, $C_6Cl_2(OH)_2.CO_2.Bi(OH)_2$, m. 155°, lemon-yellow, is prepd. from $(HO)_3Cl_2C_6CO_2H$; it has no therapeutic value. *Basic bismuth dibromogallate*, $C_7H_3O_7Br_2Bi$, m. about 150°, olive-green; *basic bismuth di-iodogallate*, $C_7H_3O_7I_2Bi$, dark yellow. These 2 salts are sol. in concd. H_2SO_4 with formation of a red and then a black color and evolution of vapors of the halogen. Both are useful in dermatology and act as local astringents.

H. S. PAINE.

β-Fluoroethyl alcohol and acetate. FRÉD. SWARTS. *Bull. sci. acad. roy. belg.* 1914, 7–17; *J. Chem. Soc.* 106, I, 475.—*β-Fluoroethyl acetate*, $Me.CO_2.CH_2.CH_2F$, prepd. by the action of HgF or AgF on the corresponding bromo deriv., is a colorless liquid with the odor of AcOEt, b_{758} 119.3° (cor.), b_{27} 45.5°, d_{20} 1.0982, n_D^{10} 1.37792, and is rapidly hydrolyzed by H_2O in which it is readily sol.; it forms a compd. with $CaCl_2$. *β-Fluoroethyl alcohol*, $CH_2F.CH_2.OH$, obtained by hydrolyzing the acetate by means of dil. acid, is a colorless liquid with the odor of EtOH, b_{767} 103.35°, d_0 1.12972, $d_{18.2}$ 1.11124, $n_D^{18.4}$ 1.36470; it crystallizes in long, transparent needles at —26.45° and its heat of combustion at const. vol. is 290.16 cal. It mixes with H_2O in all proportions and readily dissolves $CaCl_2$ and $Ca(NO_3)_2$. PBr_3 converts it into *s-bromofluoroethane*, $CH_2Br.CH_2F$, b. 71–72.5°, but attempts to transform it into the corresponding aldehyde by treatment with $Na_2Cr_2O_7$ and H_2SO_4 yielded only fluoroacetic acid.

H. S. PAINE.

Crystallographic investigations of diphenyl and its derivatives. KARL MIELEITNER. Munich. *Z. Kryst. Min.* 55, 51–87(1915).—M. gives the crystallographic properties of all of the obtainable crystals of diphenyl and 22 of its *ortho* and *para* F, Cl, Br, NO_2, NH_2, OH, COOH, etc., derivs.

A. WANDTKE.

Possibility of a new instance of optical activity without an asymmetric carbon atom. HAROLD KING. *Proc. Chem. Soc.* 30, 249–51(1914).—The possibility of further examples of centro-asymmetric type, differing widely from the previous known cases (1-methylcyclohexylideneacetic acid and cyclohexanone-4-carboxylic acid) is perceivable from Cain's 2 *o*-dinitrobenzidines, 2 *o*- and 4 *m*-dinitro-*o*-toluidines. Each one of these pairs of isomerides represents a new instance of the centro-asymmetric type of enantiomorphous compd. capable of resolution into its optically active isomerides. The existence of such a possibility is shown from the visual examn. of the configurations of 3,5′-dinitrobenzidine and its mirror image. The configurations are not identical, since they are not superimposable, and the compd. should be capable of resolution. 3,3′-Dinitrobenzidine is shown to be unresolvable. The deductions are only valid

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if the underlying principle of Kaufler's spatial formula is accepted. No expts. are described. E. B. MILLARD.

Nitro derivatives of dinaphthothioxin. BROJENDRANATH GHOSH AND SAMUEL SMILES. London. *J. Chem. Soc.* **107**, 1144–8(1915).—Chloronitrodinaphthothioxin (*C. A.* **8**, 3434) (*A*), triturated with HNO_3 (d. 1.42) slowly gives chloronitrodinaphthothioxin oxide, $ClC_{10}H_5\langle SO \rangle C_{10}H_5NO_2$, yellow prisms, m. 268° (decompn.); reduction with AcCl in the presence of a little PhOAc to react with any halogen formed gives (*A*). 20 cc. H_2SO_4 were slowly added, with cooling, to a suspension of 5 g. dinaphthothioxin in 20 cc. HOAc and 10 cc. HNO_3 (d. 1.42) and the soln. poured into H_2O after 1 hr. at room temp.; the resulting *dinitrodinaphthothioxin oxide* could not be purified; reduction as in the previous case gave *dinitrodinaphthothioxin*, orange prisms, m. somewhat above 300°. *Dinitroisodinaphthothioxin oxide*, from isodinaphthothioxin, could not be purified; *dinitroisodinaphthothioxin*, orange prisms, m. 274–5°. On the H_2O bath 5 g. mononitronaphthosulfonium quinone in 50 cc. Ac_2O containing 1 g. camphorsulfonic acid gave *nitroacetoxydinaphthothioxin*, $O_2NC_{10}H_5\langle S \rangle C_{10}H_5OAc$, red needles, m. 245–6°, did not yield the oxide. In the absence of a substance capable of taking up halogen in the reduction of the oxides, Cl may be evolved, or may even replace a NO_2 group. The formation of intermediate quinonoid compds. as in the case of the *o*-sulfoxides of Ph_2NH and Ph_2CH_2 was not observed. M. HEIDELBERGER.

Phototropy and thermotropy. VII. Polymorphic anisylidenearylamines produced by trituration and by the influence of actinic light. ALFRED SENIER AND ROBERT B. FORSTER. Galway. *J. Chem. Soc.* **107**, 1168–73(1915); cf. *C. A.* **9**, 1906.—(th = thermotropic, lt = higher limit of thermotropy, tl = thermotropic at the temp. of solid CO_2, tlt = thermotropic between room temp. and the temp. of solid CO_2, r = polymorphic form obtained by trituration, s = deeper colored polymorphic form obtained by exposure to sunlight. All m. ps. are corr.) *Anisylidene derivatives* of: Aniline, *m*- and *p*-toluidines, not th, nor affected by light. *o-4-Xylidine*, needles, m. 74–5°, tlt. *m-4-Xylidine*, pale yellow plates, m. 65–6°, tl, lt 65°. *p-Xylidine*, biscuit-colored prisms, m. 68–9°, tlt, s. *ψ-Cumidine*, faintly yellow prisms, m. 66°, tl, lt 65°. *o-Chloroaniline*, almost colorless needles, m. 61°, th 20–60°. *m-Chloroaniline*, biscuit-colored prisms, m. 54°, tlt, s. *p-Chloroaniline*, plates, m. 93–4°, not th. *m-Bromoaniline*, needles, m. 61–2°, not th; s. *p-Bromoaniline*, faintly yellow needles, m. 120°, th 20–118°; s, deep canary-yellow and 6–7° (cf. Hantzsch and Schwab, *Ber.* **34**, 832(1901)), th 20–145°; s. *o-Aminophenol*, tl, lt 85°, s. *p*-Aminophenol, th 20–185°. *p*-Anisidine, needles, m. 14[illegible] *acid*, yellow needles, m. 145°, th 20–145°, with the deepest color at about 120°. *m-Aminobenzoic acid*, yellow or biscuit-colored needles, m. 151–2°; the latter variety is th[illegible] of *p-Aminobenzoic acid*, pale by trituration into the yellow form, reverts about 70°; s. [illegible], lt 100°; s. β-Naphthylyellow needles, m. 196–7°, th 20–195°. α-Naphthylamine, t[illegible]e sen. 257–8°, tl, lt 250°; s. amine, tl, lt 95°; s. *Dianisylidenebenzidine*, yellow plates, [illegible] *Soc.* M. HEIDELBERGER.

3-Thiolphenanthrene and some of its derivatives. E[illegible]° in [illegible]LEN FIELD. London. *J. Chem. Soc.* **107**, 1214–7(1915).—A soln. of 60 cc. H_2SO_4 in 1[illegible]on [illegible]80 cc. H_2O was slowly added to a mixt. of 10 g. phenanthrene-3-sulfonyl chloride and [illegible]d, [illegible]0 g. Zn dust, and the mixt. boiled 2 hrs. under a reflux after the 1st reaction had [illegible]with [illegible]subsided. The crude *3-thiolphenanthrene* (*A*), $C_{14}H_{10}S$, was extd. with Et_2O and b[illegible] 205[illegible]-10°, plates, m. 112–3°; alk. solns. are readily oxidized; the *disulfide* is best prepd., h[illegible]oup. [illegible]owever, by oxidation [illegible]914).

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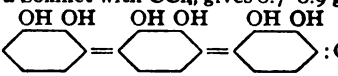
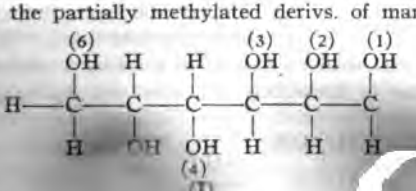
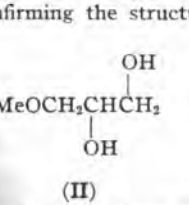
with alc. I; it forms needles, m. 165°. MeI and alc.-Na give *3-methylthiolphenanthrene* in the absence of air, b_{12} 240°, needles, m. 100°; boiled a few min. in HOAc with CrO_3 it gives *3-anthraquinonyl methyl sulfone*, orange needles, m. 280–2° (decompn.). 4.2 g. (*A*) and 3.26 g. $Pb(OAc)_2$ in alc. gave a yellow, amorphous ppt. which was dried and distd. *in vacuo*. Some (*A*) and 2 g. crude *diphenanthryl 3-sulfide*, b_2 330–60°, were obtained; after removing the (*A*) with Et_2O it b_2 360° and forms cream needles, m. 225°, very stable and difficult to burn. *3-Acetylthiolphenanthrene*, from (*A*) and AcCl, needles, m. 93°; *3-benzoylthiolphenanthrene*, best purified by distn. *in vacuo*, needles, m. 115°. M. HEIDELBERGER.

An oxidation product of pyrogallol. MAXIMILIAN NIERENSTEIN. Univ. Bristol. *J. Chem. Soc.* **107**, 1217–20(1915).—A current of air was passed through a soln. of 10 g. 1,2,3-$C_6H_3(OH)_3$ in 100 cc. 2 *N* KOH until $FeCl_3$ no longer gave a blue color with an Et_2O ext. of the acidified soln. (2–3 hrs.). The soln. was acidified, extd. with Et_2O, and the solid thus obtained dissolved in 30–50 cc. abs. alc. and 20–30 cc. $CHCl_3$ added. The resulting "pyrogallol black" (3.8–4.7 g.), extd. in a Soxhlet with CCl_4, gives 0.7–0.9 g. *2,3,2',3',2'',3''-hexahydroxytriphenoquinone* (*A*),  yellow needles, m. 274–5° (decompn.), volatilizes in a desiccator, forming yellow needles smelling like quinone, turns dark brown in alk. soln., reduces Fehling soln. and $AgNO_3$, and gives a green color with $FeCl_3$; *phenylhydrazone*, $C_{18}H_6(OH)_6(NNHPh)_2$, brown needles, m. about 304–8° (decompn.); *p-bromophenylhydrazone*, red needles, m. about 312–4° (decompn.). The structure assigned is based on the work of N. and Rixon (*C. A.* **7**, 793), as a direct proof failed owing to inability to cause decompn. Reduction with hot Ac_2O and Zn dust for 5 hrs., followed by hydrolysis, gave *2,3,2',3',2'',3''-octahydroxy-1,4-diphenylbenzene*, needles with 1 H_2O, m. 329–33° (decompn.). When anhydrous, it darkens above 250° and apparently m. 300–20°; when oxidized by the methods used in the prepn. of purpurogallin (*C. A.* **8**, 128) it gives a red product resembling purpurogallin; with $FeCl_3$ it gives a blue color, changing to greenish blue; distd. with Zn dust, it gave a substance m. 209.5° (cor.) which was probably *p*-$C_6H_4Ph_2$; *octaacetate*, needles, m. 262–4°; *octa-p-nitrobenzoate*, from (*A*) in alk. soln. and the chloride, in an atm. of H, cubes, m. 250–2°. The formation of (*A*) confirms Harries' theory of the oxidation of pyrogallol (*Ber.* **35**, 2954(1902)). M. HEIDELBERGER.

Influence of configuration on the condensation reactions of polyhydroxy compounds. II. Effect of boric acid on the conductivity and specific rotation of methylated derivatives of mannitol. JAMES C. IRVINE AND ETTIE S. STEELE. Univ. St. Andrews. *J. Chem. Soc.* **107**, 1221–9(1915); cf. *C. A.* **8**, 2341.—Böeseken's conclusion that the joint increase in [α] and conductivity shown by certain poly-HO compds. in the presence of H_3BO_3 is only encountered when 2 OH groups are attached to adjacent C atoms and are arranged on the same side of these atoms (*C. A.* **8**, 95) has been applied to the study of the partially methylated derivs. of mannitol, confirming the structure (I)



(I)



(II)

previously adap… mannitol. Th… were similar to those used by B. In order to… the terminal p… assumes preferentially a position adjace… ary group … made with glycerol α-Me ether (*C. A.* 9, … the conducti… ed, indicating the st…

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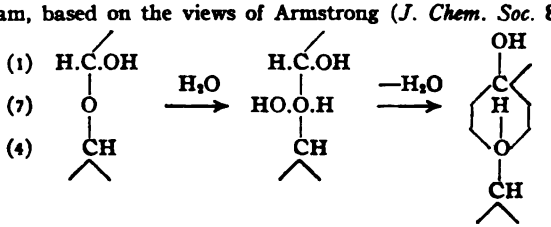
ture (II). The conductivity values given below were detd. at 25° in $N/4$ soln., the numbers referring, resp., to $K \times 10^6$ in H_2O, $K \times 10^6$ in $N/2$ H_3BO_3, and the exaltation. (I): 36.9, 407.5, 341.3; pentamethylmannitol, $MeOCH_2[CH(OMe)]_4CH_2OH$, 30.1, 43.2, —16.2; ε,ζ-dimethylmannitol (*A*), $MeOCH_2CH(OMe)[CH(OH)]_3CH_2OH$, 33.6, 405.9, 343, showing that the exposure of the groups 1, 2, 3, 4 has the same effect as when all the groups are free; γ,δ,ε,ζ-tetramethylmannitol (*B*), $MeOCH_2[CH(OMe)]_3CH(OH)$-CH_2OH, 64.7, 410.6, 316.6, in contrast to the isomeric β,γ,ε,ζ-tetramethylmannitol, $MeOCH_2CH(OMe)CH(OH)[CH(OMe)]_2CH_2OH$ (*C*), 110.7, 120.0, —20.0, emphasizing the fact that the groups reacting with H_3BO_3 must be attached to adjacent C atoms. Mannitolmonoacetone and mannitoldiacetone also gave negative exaltation. In all cases except the last 2, in which, owing to hydrolysis, it was difficult to obtain accurate results, the exaltation diminished with the diln. The results, which are tabulated at various dilns., are also represented on curves. Those for (I), (*A*) and (*B*) are practically coincident. It is thus shown that OH groups 1 and 2 are primarily responsible for the exaltation of cond. This is accounted for in (I) by representing groups 3, 4 and 5, 6 with their pairs of OH on opposite sides of the C chain. The optical effects of the addition of H_3BO_3 were not as marked as the changes in cond. A new value is given for the $[\alpha]_D^{20}$ of (*C*) in H_2O, 38.54°. M. HEIDELBERGER.

Mechanism of mutarotation in aqueous solution. JAMES C. IRVINE AND ETTIE S. STEELE. *J. Chem. Soc.* 107, 1230–40(1915).—A further application of Böeseken's cond. method (cf. preceding abstr.). Exception is made to some of B.'s conclusions and the statement made that "the clue to the mechanism of mutarotation in aq. soln. is to be found in (*a*) the production of evidence as to whether or not H_2O becomes added to the sugar during the change, and (*b*) evidence as to whether the new OH group thus introduced is attached to the terminal C atom of the chain or to the O atom of the ring." This evidence was sought in a study of tetramethyl-α-methylglucoside (*A*), $MeOCH_2CH(OMe)\underline{CH.[CH(OMe)]_3.CH(OMe).O}$, and tetramethylglucose (*B*). In $N/2$ soln. (*A*) showed an exaltation of cond. of 25.5, in $N/32$ soln., —7.3, a result which is accounted for by the assumption that an oxonium hydrate is formed to some extent on the ring O. Both the γ-oxidic formula and the aldehyde formula for (*B*) contain but 1 OH group, so that any exaltation must be due to the addition of H_2O, thus introducing a second, adjacent OH group. The α-form of (*B*) was studied in $N/8$ soln. until the change $\alpha \rightleftharpoons \beta$ was complete. In aq. soln. $K \times 10^6$ showed a steady increase until its value was nearly doubled, while in H_3BO_3 soln. the exaltation was negative at first and ended with a value 6 times as great. This at once disposes of the view that the mutarotation depends on the sequence γ-oxidic form (α) ⟶ aldehydic form ⟶ γ-oxidic form (α + β). In H_3BO_3 both the cond. and $[\alpha]_D^{20}$ pass through max., showing that the process is very complex. It is concluded that the sugar does not assume the aldehydic form, and, on the basis of B.'s generalizations, that oxonium hydrate formation takes place on the O of the γ-oxidic ring. Since the final cond. is high, the final equil. is α-form $\rightleftharpoons$ oxonium hydrates $\rightleftharpoons$ β-form. The formation of 1 stereoisomeride from the other without rupture of the ring is shown by the following diagram, based on the views of Armstrong (*J. Chem. Soc.* 83, 1305(1903)):



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where (1) is the reducing group, (7) the O of the ring, and (4) the γ-C. The final form of sugar obtained depends upon which of the double bonds is opened out. The possibility of the formation of 2 isomeric oxonium hydrates is also pointed out. The mutarotation of glucose is also considered to take place in the same manner, but the view is taken that the mechanism of mutarotation varies with the solvent used, as numerous workers have observed peculiarities in other solvents. An objection is also made to the use of the term "mutarotation" to include non-reversible reactions such as the changes shown by glucose in HCO_2H soln. M. HEIDELBERGER.

Action of Grignard's reagent on hydroxyketonic dyestuffs and their ethers. ARABINDA SIRKER. Bengal. *J. Chem. Soc.* 107, 1241–7(1915).—Watson and Sen (*C. A.* 8, 1748) found that by treating pentaethylquercitin with EtMgI and de-ethylating the product, H_2O was split off and quinonoid dyes of deeper shade than the original quercitin were formed. Below are the results of an attempt to extend this method. HOAc was found to be the best solvent for alizarin di-Me ether (*A*). (*A*) was boiled in Et_2O (100 cc. for each g.) with 1.5 mols. EtMgI for 8 hrs. and the product poured into dil. HCl, yielding 22% of *10-hydroxy-5-keto-1,2-dimethoxy-10-ethyldihydroanthracene* (*B*), $CO.C_6H_4.CEt(OH).C_6H_2(OMe)_2$, reddish yellow needles, m. 188°. Demethylation with HI and Ac_2O yielded only a tar, but with 2 parts $AlCl_3$ at 160° for 1 hr. it gave *1,2,10-trihydroxy-5-keto-10-ethyldihydroanthracene*, pale red needles, m. 275°; yield, 80%; it dyes chrome-mordanted wool a deeper violet than alizarin. (*B*) is also formed when 3 mols. EtMgI are used, but using 2.5 mols. and only 10–12 cc. Et_2O for each g. (*A*), taking all precautions against overheating, and boiling gently for 5 hrs., 18% of *5,10-dihydroxy-1,2-dimethoxy-5,10-diethyldihydroanthracene*, $C_{20}H_{24}O_4$, was formed, crimson needles, m. 149°, sepd. from (*B*) and unchanged (*A*) by fractionation from alc. At 138–40° for 1 hr. with $AlCl_3$ it gave 84% of *1,2,5,10-tetrahydroxy-5,10-diethyldihydroanthracene*, brown needles, m. 198°, sol. in aq. KOH with a pink color and dyes maroon shades on chrome-mordanted cotton. Detailed directions are given for the prepn. of 7-ethoxy-γ-benzopyrone (cf. Kostanecki, Paul, and Tambor, *Ber.* 34, 2477(1901)). The intermediate 7-ethoxy-γ-benzopyrone-2-carboxylic acid was esterified in boiling alc. by means of dry HCl; the resulting *ethyl ester*, hairs, m. 118°, was treated in concd. Et_2O soln. with *o*-$MeOC_6H_4MgBr$ (1 mol.), but as no dyes were produced in the reaction, it was not carefully investigated. M. HEIDELBERGER.

Interaction of dimercuriammonium nitrite and the alkyl iodides. PRAFULLA C. RAY. Calcutta. *J. Chem. Soc.* 107, 1251–4(1915).—An attempt to throw light on the structure of dimercuriammonium nitrite (*A*). The reaction follows the course: $NHg_2NO_2 \xrightarrow{R} N + Hg + (HgNO_2 + RI = HgI + RNO_2)$, in which RNO_2 is a mixt. of equal parts of RONO and RNO_2. This view is taken on the basis of the study previously made of the action of alkyl halides on $HgNO_2$ (*C. A.* 2, 792) and was confirmed by a study of the reaction between (*A*) and MeI, EtI and PrI. RNO_2 was isolated in each case and the RONO detd. quant., the amt. corresponding fairly closely with the theory. MeI acts on (*A*) in the cold, but heating to 100° for 0.5–0.75 hr. is necessary to complete the reaction, which is marked by a change in color of the salt to deep red. The possibility of the decompn. products arizing directly from the action of RI on (*A*), instead of the intermediate $HgNO_2$, is not excluded, but the other theory given is better in accordance with the decompn. of NHg_2Cl by heat, HgCl being formed. M. HEIDELBERGER.

Basic copper formates. GEORGE FOWLES. Hammersmith. *J. Chem. Soc.* 107, 1281(1915).—The formula $Cu(HCO_2).2Cu(OH)_2$ given by Riban (*Bull. soc. chim.* [2] 38, 113(1882)) for the insol. basic salt formed on boiling solutions of $Cu(HCO_2)_2$, (*A*)

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is evidently a misprint, as the analysis indicates the comp. $Cu(HCO_3)_2.2Cu(OH)_2$ (*B*). If dil. solns. are merely warmed, the *compound* $Cu(HCO_3)_2.3Cu(OH)_2$ is pptd. at temps. below the b. p., pale green cryst. powder. A ppt. of the same comp. is formed when $Cu(OH)_2$ is added to a boiling soln. of the formate; it is pale blue and tends to become gelatinous on washing. In contact with a soln. of (*A*) it passes over into (*B*), slowly in the cold, more quickly on heating. (*B*), obtained in this way, forms emerald-green, rhombic tablets. M. HEIDELBERGER.

Syntheses of derivatives of 3-oxy(1)thionaphthene. SAMUEL SMILES AND BROJENDRANATH GHOSH. London. *J. Chem. Soc.* **107**, 1377–81(1915).—An extension of the method of synthesizing thianthrene and thioxanthones by the oxidizing action of H_2SO_4 on ArSH (*C. A.* **5**, 3047). When a larger excess of $AcCH_2CO_2Et$ is used than called for in the prepn. of 3-oxy(1)thionaphthene (*A*), $C_6H_4.C(OH):CH.S$ (*C. A.* **5**, 3263), the chief product of the reaction becomes *methyl(1)thionaphthocoumarin* (*B*), $C_6H_4.C.O{-}{-}CO$ | || | , pale buff prisms, m. 164–5°, also prepd. by the condensation of $S{-}{-}C.CMe:CH$ (*A*) with more than 1 equiv. of $AcCH_2CO_2Et$ in H_2SO_4 at 50–5°; yield, theoretical in both cases. (*A*) was also prepd. from *o*-$HSC_6H_4CO_2H$ and CH_2Ac_2 in H_2SO_4 at 50° for 0.75 hr. The intermediate Ac deriv. could not be isolated, but when $BzCH_2Bz$ was used, *2,2-dibenzoyl-3-oxy(1)thionaphthene*, $C_6H_4.CO.CBz_2.S$, was obtained, orange-brown needles with a characteristic odor, m. 79°, yields (*A*) with fused alkalies. Using $BzCH_2Ac$, *2-benzoyl-3-oxy(1)thionaphthene* was formed, dark orange needles, m. 115°, gives a greenish brown color in alc. with $FeCl_3$, and yields thioindigo with H_2SO_4 at 75°; the Na salt is yellow. (*A*) also gives thioindigo on heating with H_2SO_4 above 70°. *o*-$HSC_6H_4CO_2H$ and $EtO_2CCOCH_2CO_2Et$ in H_2SO_4 at 45–50° for 15 min. gave orange needles, m. 186–7°, yielding with alkalies a red salt which is not decompd. by CO_2. The nature of this substance has not yet been detd. M. HEIDELBERGER.

Higher homologs of cyclohexane. O. M. HALSE. Univ. Christiania. *J. prakt. Chem.* **92**, 40–8(1915).—H. has succeeded in converting most of the C_6H_6 homologs of the type PhCRR'R", previously prepd. by him (cf. *C. A.* **8**, 2702), into the corresponding cyclohexane derivs. by reduction in the presence of Pt black, according to the method of Willstätter and Halt (cf. *C. A.* **6**, 2613). 5 cc. of the hydrocarbon in 10 cc. glacial AcOH with 0.5 g. Pt black were shaken with H, until the calcd. quantity or a trifle more was absorbed, a 2nd addition of 0.5 g. Pt usually being required for complete absorption. In this manner the following cyclohexane derivs. were obtained: *Trimethylcyclohexylmethane*, $C_6H_{11}CMe_3$, b. 166–7°, d_4^{16} 0.8305, n_D^{16} 1.45562; *dimethylethylcyclohexylmethane*, b. 191–2°, d_4^{16} 0.8226, n_D^{16} 1.4538; *dimethylpropylcyclohexylmethane*, b. 206–7°, d_4^{16} 0.8372, n_D^{16} 1.4670; *methyldiethylcyclohexylmethane*, b. 207–8°, d_4^{16} 0.8310, n_D^{16} 1.4574; *triethylcyclohexylmethane*, b. 222–3°, d_4^{16} 0.8388, n_D^{16} 1.4658; *dimethylisobutylcyclohexylmethane*, b. 220–1°, d_4^{16} 0.8304, n_D^{16} 1.4580; *methylethylpropylcyclohexylmethane*, b. 224–6°, d_4^{16} 0.8406, n_D^{16} 1.4646; *dimethylisoamylcyclohexylmethane*, b_{20} 134–5°, d_4^{19} 0.8512, n_D^{23} 1.4685; *methyldipropylcyclohexylmethane*, b_{13} 115–6°, d_4^{19} 0.8483, n_D^{19} 1.4717; *diethylpropylcyclohexylmethane*, b_{18} 114–16°, d_4^{19} 0.8547, n_D^{23} 1.4754; *methylethylisoamylcyclohexylmethane*, b_{10} 120–1°, d_4^{19} 0.8717, n_D^{23} 1.4871; *ethyldi-n-propylcyclohexylmethane*, b_{13} 129–30°, d_4^{19} 0.8376, n_D^{23} 1.4598; *methyldiisobutylcyclohexylmethane*, b_{11} 133–5°, d_4^{19} 0.8396, n_D^{23} 1.4622; *tripropylcyclohexylmethane*, b_{11} 133–5°, d_4^{19} 0.8382, n_D^{23} 1.4606; *dipropylisobutylcyclohexylmethane*, b_{10} 148–50°, d_4^{19} 0.8441, n_D^{23} 1.4658; *methyldiisoamylcyclohexylmethane*, b_{12} 156–8°, $d_4^{20.5}$ 0.8440, n_D^{20} 1.4666; *ethyldiisoamylcyclohexylmethane*, b_{10} 162–4°, $d_4^{20.5}$ 0.8681, n_D^{20} 1.4789; *propyldiisoamylcyclohexyl-*

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methane, b_{17} 190–2°, $d_4^{20.5}$ 0.8421, n_D^{20} 1.4646; and *isobutyldiisoamylcyclohexylmethane*, b_8 162–3°, $d_4^{20.5}$ 0.8797, n_D^{20} 1.4905. The yields in every case are very nearly quant. The *n* and d. of the reduced forms are significantly lower than the values for the corresponding unsatd. hydrocarbons. NORMAN A. SHEPARD.

Quinic acid. HERMANN EMDE. *Apoth. Ztg.* 30, 247(1915).—Expts. were undertaken to prove the presence or absence of an α-HO by replacement of the CO_2H with an NH_2 radical. In the event that an α-HO were present, the formation of a keto-trihydroxyhexamethylene would be expected, while in its absence a quercitol should result. Shortly after taking up the work with tetramethylquinic acid, expts. had to be discontinued on account of more pressing matters. W. O. E.

Nitration of some phenol derivatives. A. F. HOLLEMAN AND J. M. A. HOEFLAKE. *Verslag. Akad. Wetenschappen* 23, 1128(1915).—In the course of some expts. on the nitration of a number of Ph esters, it was observed that the esters of H_3PO_4 and H_2CO_3 could be very readily changed to the mono-NO_2 compds. while the esters of the aliphatic acids presented the same difficulties as the nitration of PhOH itself. In every case both *o*- and *p*-compds. were formed. The respective amts. of the 2 isomers in the case of the phosphate and carbonate esters could be estimated by measuring the effect of the ester on the unmixing point of the binary system H_2O + PhOH.
L. H. ADAMS.

Action of sodium hypochlorite on amides of α-hydroxy acids. A new decomposition method for sugars. R. A. WEERMAN. *Verslag. Akad. Wetenschappen* 23, 1129–32(1915).—W. has previously shown (*C. A.* 8, 64) how, by the use of NaClO, the amides of the α,β-unsatd. acids may be changed to aldehydes containing 1 atom less of C. The same process has now been applied to the amides of the α-HO acids. As an example, $PhCH(OH)CONH_2$ is broken down, the end product being BzH. Similarly *d*-glucose was changed to *d*-arabinose, by first prepg. *d*-gluconic lactone which was then treated with NH_3 in abs. alc. in order to form the *d*-gluconic amide, which in turn was treated with alk. NaClO. The *d*-arabinose produced was isolated as the diphenylhydrazone (yield 50%), m. 206–7° (cor.). From this compd. free *d*-arabinose was made by treatment with HCHO. In the same way *d*-xylose was made from *d*-galactose and isolated as the *p*-bromophenylhydrazone, m. 156–7°. The method is being applied to other sugars. L. H. ADAMS.

Action of nitrosylsulfuric acid on *p*-hydroxybenzoic acid. J. BIEHRINGER AND W. BORSUM. Braunschweig. *Ber.* 48, 1314–9(1915); cf. Deninger, *J. prakt. Chem.* 42, 552(1890).—From 20 g. p-$HOC_6H_4CO_2H$ in 250 g. concd. H_2SO_4 treated in the course of 5 min. with 27 g. $NaNO_2$ in 250 g. H_2SO_4 and vigorously stirred 7 hrs. at 35–40° are obtained $4,3$-$HO(HO_3S)C_6H_3CO_2H$ as chief product, $4,3$-$HO(O_2N)C_6H_3CO_2H$ in somewhat smaller amt., a little $2,4$-$(O_2N)_2C_6H_3OH$ and very small quantities of other substances. Cf. the original for details of sepn. and identification. C. A. R.

Preparation of 9-benzoylfluorene. WILHELM WISLICENUS AND ALFRED FEHRLE. Univ. Tübingen. *Ber.* 48, 1320–3(1915).—Werner's method (*Ber.* 39, 1287(1906)) for the prepn. of 9-benzoylfluorene (*a*) gives only a 7% yield; the following modification increases the yield to 80%; 14 g. BzOEt (free from acid) and 2.4 g. bright K shavings are treated with 5 g. fluorene, allowed to stand 1–2 days, heated some hrs. on the H_2O bath (moisture must be excluded throughout the process), treated with a little alc. to destroy the K left, shaken with 70 cc. ice H_2O, then with 70 cc. ligroin (b. 70–100°), and the aq. layer is treated with AcOH to a permanent turbidity and the (*a*) pptd. with CO_2. As a powder or in very fine crystals, (*a*) is colorless; larger crystals and alc. solns. are faintly yellow; addition of a trace of NaOH to the latter at once produces a deep, dark yellow color, probably owing to a change of the keto into the enol form;

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H_2SO_4 gives an orange-yellow soln. changing on heating through bright yellow to dirty green, red-violet and finally violet-black; boiling NaOH gives fluorene and BzONa; heating with $PhNHNH_2$ alone or in C_6H_6 or alc. gives no hydrazone, whereas 5.4 g. (*a*) boiled 1.5 hrs. with 2.2 g. $PhNHNH_2$ in 30 g. AcOH yields 4.5 g. of a *compound*, $C_{26}H_{17}N$, yellowish, microscopic, rectangular plates from AcOH, m. 217–8°, seps. from C_6H_6 in colorless crystals of the same appearance but containing 1 mol. C_6H_6, sol. in H_2SO_4 without peculiar color phenomena. If, instead of boiling, the (*a*) and $PhNHNH_2$ are heated at 70° until soln. is complete and allowed to stand 1 day in the ice chest, there is obtained the same compd., mixed with a substance sepg. from AcOH in almost black cryst. granules, m. 150–5°, sol. in H_2SO_4 with violet-red color. C. A. R.

A new oxidation product of cholic acid. HANS PRINGSHEIM. Univ. Berlin. *Ber.* 48, 1324–7(1915).—The cholic acid used m. 198° sharply, contained 70.21% C and 9.75% H and showed a mol. wt. of 406–394 in PhOH; 10 g. of this acid in 650 cc. H_2O and 100 cc. of 43% KOH are heated 1 hr. on the H_2O bath with 20 cc. Br, filtered from the brominated ppt., the filtrate treated with bisulfite and H_2SO_4 until colorless and acid, extd. with Et_2O in a continuous extractor until the liquid is clear (several hrs.) and the ext. concd. and allowed to stand overnight in the cold; there is thus obtained 0.7 g. of *biliobanic acid*, long needles from 50% alc., or aq. acetone, begins to decomp. 285° when heated rapidly, contains 64.78–65.25% C and 7.40–7.57% H (corresponding to $C_{22}H_{28}O_7$ or $C_{23}H_{30}O_7$), mol. wt. in urethan 401–393, $[\alpha]_D^{20}$ 22.42–22.01° in *N* NaOH; it gives a negative Pettenkofer test and does not condense with ketone reagents. CHAS. A. ROUILLER.

E. C. Baly's experimental grounds for the "fields of force theory." A. HANTZSCH. *Ber.* 48, 1327–32(1915).—H. attacks the exptl. observations and the theoretical deductions therefrom reported by B. in various papers (*C. A.* 7, 3902; 8, 1413; 9, 1312, 2229). CHAS. A. ROUILLER.

Chromoisomerism of the phenolaldehyde salts. A. HANTZSCH. *Ber.* 48, 1332–8 (1915).—Answer to Pauly (*C. A.* 9, 2253). CHAS. A. ROUILLER.

Chromoisomerism of the acridonium salts. A. HANTZSCH. *Ber.* 48, 1338–40 (1915).—That, contrary to Kehrmann (*C. A.* 8, 111), acridonium salts do not form meriquinoid salts even under the most favorable conditions and that all the polychromic forms studied by H. are true chromoisomers is shown by the following facts: These salts behave towards reducing agents in an entirely different manner from phenazonium salts, either not being reduced at all or being at once wholly reduced to the almost colorless dihydro derivs.; the red and green forms of the phenylacridine acid sulfate formed from the components always cryst. together from alc. without the green form oxidizing, like meriquinoid salts, in the air, and the green salt gives the same yellow solns. as the red form; the only salt which, owing to its prepn. from methylphenylacridone and H_2SO_3 and to the dark green color of its crystals from H_2O, might have been meriquinoid, is the sulfite, but its aq. solns. have the same yellow color and the same stability to air as the other salts; conversely, oxidation of hydroacridines, under the conditions leading to the formation of meriquinoid salts from hydrophenazine and p-$H_2NC_6H_4NMe_2$, yields directly the holoquinoid phenylacridine salts, sol. with yellow color; finally, by mixing equimol. amts. of phenylacridine and hydrophenylacridine in alc. no darker color can be obtained either in the air or on addition of acids. CHAS. A. ROUILLER.

Constitution of the salts from benzylideneaniline. A. HANTZSCH. *Ber.* 48, 1340–4(1915).—Reply to Franzen and Henglein (*C. A.* 9, 1911). C. A. R.

Diazonium perhalides. A. HANTZSCH. *Ber.* 48, 1344–5(1915).—That H.'s diazotrihalides (*Ber.* 28, 2754(1895)) have the structure $ArN(:N)X_3$ which he assigned

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to them, and not the constitution $ArNXNX_2$ suggested by Chattaway (*C. A.* **9**, 1015; cf. also Forster, *C. A.* **9**, 1313), is shown by the fact that *phenyltrimethylammonium tribromide*, $PhNMe_3Br_3$, is pptd. by adding Br-KBr to aq. $PhNMe_3SO_4Me$ and seps. from alc. in golden yellow scales, sol. in H_2O only with great difficulty and with liberation of Br, and so stable in a desiccator over lime that after 2 months it loses only a very little Br (found, 63.4%; calcd., 63.8%); it, therefore, differs just as much as PhN_2Br_3 from C.'s NH_4Br_3. CHAS. A. ROUILLER.

Action of phenylmagnesium bromide on tellurium dihalides. KARL LEDERER. Brüssel. *Ber.* **48**, 1345–50(1915).—To the Grignard reagent from 130 g. PhBr and 20.7 g. Mg in 500 cc. Et_2O is slowly added 60 g. $TeBr_2$, the mixt. boiled 2–3 hrs., decompd. with ice H_2O, the black sludge thoroughly digested with Et_2O, the Et_2O shaken repeatedly with H_2O, the Et_2O, the C_6H_6 formed and the PhBr distd. off in CO_2 under atm. pressure; distn. of the residue under 14–15 mm. gives 15.3 g. Ph_2 (mixed with a little Ph_2Te) at 130–60°, while between 160–90° (chiefly 180–2°) Ph_2Te passes over; this is purified by conversion into the dibromide, the yield of which is 56 g. The residue consists of Te and *diphenyl ditelluride*, the latter sepg. (2 g. yield) from hot Et_2O in long blood-red fibers, m. 53–4°. The sludge, after digestion with Et_2O and treatment with HCl to remove the $Mg(OH)_2$, leaves 5.7 g. Te. The HCl soln. yields to Et_2O diphenyltelluronium salts, formed by oxidation by the air. From 190 g. PhBr, 30.2 g. Mg and 60 g. $TeCl_2$ treated as above are obtained 17 g. Ph_2, 81 g. Ph_2TeBr_2 and 1.6 g. Ph_2Te_2; 100 g. PhBr, 15.9 g. Mg and 60 g. TeI_2 give 43.2 g. Ph_2TeBr_2 and 1.5 g. Ph_2Te_2, while 130 g. PhI, 15.9 g. Mg and 60 g. TeI_2 yield 12.4 g. Ph_2, 48.4 g. Ph_2TeI_2 and 2.2 g. Ph_2Te_2. The Ph_2Te is obtained in 60 g. yield from 100 g. of the Ph_2TeBr_2 with bisulfite. When 3 g. of the Ph_2Te_2 in 250 cc. alc. is treated with 5 g. Na, it is largely decompd. into Te and Ph_2Te but a part goes over into *phenyltellurol*, PhTeH; H_2O is added, the soln. extd. with Et_2O, filtered, acidified with HCl, extd. with Et_2O and shaken with $HgCl_2$; there is formed an amorphous yellow ppt. of the *compound* PhTeHgCl, decomps. from 90° up. *Phenyltellurinic-nitric acid*, $PhTe(:O)NO_3$, from 1 g. Ph_2Te_2 introduced into 35 cc. of 65% HNO_3 on the H_2O bath, boiled 15 min. after the oxidation is complete and evapd. *in vacuo* over KOH, needles, sinters 229°, m. 232–3°; when dissolved in *N* NaOH and titrated back with HCl it forms *phenyltellurinic acid*, $PhTeO_2H$, powder, sinters 205°, m. 210–1°, easily sol. in acids and alkalies. *Diphenylbenyltelluronium bromide*, from 5 g. Ph_2Te and 10 g. $PhCH_2Br$ allowed to stand 5 days, sinters 83°, m. 90–1° when heated rather rapidly; with Ag_2O it gives the *hydroxide*, yellowish oil forming a picrate difficultly sol. in H_2O and alc. C. A. ROUILLER.

The β-lactone of asymmetric dimethylmalic acid. ERWIN OTT. Zürich. *Ber.* **48**, 1350–3(1915).—Whereas the isomeric series $OC.O.CMe_2.CRCO_2Me$ undergoes the ketone cleavage exclusively (*C. A.* **8**, 333), $O.CO.CMe_2.CHCO_2Me$ (*a*) gives only $CMe_2:CHCO_2Me$ (*b*) and CO_2. To obtain (*a*), dry NH_3 is passed through the dehydrated lactone in Et_2O, the pptd. NH_4 salt in slightly warm MeOH is treated with the calcd. amt. of $AgNO_3$ in just the necessary amt. of boiling H_2O, the dried and powdered Ag salt (85–90% yield) in Et_2O suspension is shaken 1 hr. with excess of MeI and the filtered soln. is concd. on the H_2O bath, giving about 60% of (*a*), oil, does not cryst. at —15°, $b_{0.04}$ 70–2°; under 18 mm. it already undergoes the decompn. into (*b*) and CO_2; on long standing with H_2O it does not dissolve although the H_2O becomes acid, while on warming it gradually hydrolyzes to $HO_2CCMe_2CH(OH)CO_2H$, not the lactone, as expected. The decompn. into (*b*) is best effected by distn. *in vacuo* over a faintly glowing Pt spiral. Thorpe and Higson's 65–70% yields of $HO_2CCMe_2CH_2CO_2H$ (*J. Chem. Soc.* **89**, 1465(1906)) could never be obtained, the max. being 41%. On the other hand, $CHNa(CO_2Et)_2$ and Me_2CBrCO_2Et in boiling xylene give 70% of pure condensation

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product. Bromination of the $HO_2CCMe_2CH_2CO_2H$ is best effected, with good yields, by heating the anhydride 2 days with the calcd. amt. of Br in sealed tubes at 140°. CHAS. A. ROUILLER.

***m*-Quinoids.** EUG. BAMBERGER. Zürich. *Ber.* 48, 1354–7(1915); cf. Schlenk and Brauns, *C. A.* 9, 1916.—In the prepn. of *m*-$O_2NC_6H_4OH$ by Bantlin's method (*Ber.* 11, 2100(1878)), the soln. must be constantly stirred during the diazotization and the diazotized soln. poured quite rapidly into boiling dil. H_2SO_4; yield, 75% after crystn. from H_2O. Treated in 20 cc. AcOH with 5 parts Br and digested 70 min. on the H_2O bath 5 g. of the $O_2NC_6H_4OH$ give 10.5 g. purified 2,4,6,3-$Br_3(O_2N)C_6HOH$; contrary to Daccomo (*Ber.*, 18, 1167(1885)), this is not reduced to $Br_3(H_2N)C_6HOH$ (*a*) by Sn and HCl but to *m*-$H_2NC_6H_4OH$; (*a*) is obtained, but in poor yield, with Fe and AcOH, and the best method of prepn. consists in treating 1 g. *m*-$H_2NC_6H_4OH$ in a little AcOH with 4.5 g. Br (Ituka, *Am. Chem. J.* 15, 44); yield, 3.1 g. No diazo oxide could be obtained from it by diazotization under various conditions. Attempts to diazotize 3,4,6-$H_2N(O_2N)_2C_6H_2OH$ by treating 2.3 g. in 30 cc. abs. alc. with dry N_2O_3 gas at 50° for 1 hr. gave 1.5 g. *dinitroresorcinol monoethyl ether*, bright yellow prisms from ligroin, m. 122–2.5°, sol. in alkalies with intense yellow color, repptd. by acids. Assuming that the diazo oxides have the quinone diazide structure, O:C_6H_4 or O:C_6H_4:N:N, the fact that these compds. are not formed from *m*-aminophenols is in agreement with the view prevailing at the time these expts. were made (1903), that *m*-quinoids are incapable of existence. CHAS. A. ROUILLER.

Dialkylcyclohexadienes and their carboxylic acids. K. v. AUWERS AND R. HINTERSEBER. Greifswald. *Ber.* 48, 1357–76(1915); cf. *C. A.* 3, 2559–60; 4, 327; Semmler, *C. A.* 4, 327.—In order to secure further evidence of the structure of the unsatd. hydroaromatic acids and hydrocarbons obtained from *o*-MeC_6H_4OH, most of the earlier expts., some of which were carried out with only small amts. of substances, have been repeated, and while the new investigation does not afford absolute proof of the correctness of the structures previously assigned to these compds. it has brought out no facts which are not in harmony with those structures while objections can be raised to all other possible structures. Taking the dimethylcyclohexadienecarboxylic acid (*a*), the chem. evidence shows beyond doubt that the side chains Me:Me:CO_2H occupy the positions 1:4:3, while the optical behavior of (*a*) (normal refractivity and moderately increased dispersive power) and of the dihydro-*p*-xylene (*b*) obtained from it by loss of CO_2 (refractivity and dispersive power so great that its double bonds must be conjugated) shows that of the 9 possible structures for (*a*) it can only have that in which the double bonds are in the 1,3- or 2,4-positions. (*a*) is stable towards Na-Hg but with Na and AmOH gives a tetrahydroxylylic acid (*c*) which is optically normal, thus excluding the Δ^2- and Δ^3-forms and leaving only the Δ^1- or Δ^4-structures for (*c*). The method of formation of (*a*), however, is not in harmony with the $\Delta^{2,4}$-structure for (*a*) and, consequently, the Δ^4-structure for (*c*). In the prepn. of the dichloropulenenone used in making (*a*), the residue remaining in the vacuum distn. of the ketone gives on rubbing with Et_2O a solid *polymer* of the ketone, brittle needles from C_6H_6, m. 190°. To prep. the *1,4-dimethyl-1,3-cyclohexadiene-3-carboxylic acid* (*a*), 50 g. of the ketone in an equal vol. of abs. alc. is slowly poured into 60 g. KOH in 300 g. boiling alc., boiled until the pptn. of KCl is complete, freed of the alc. and the little amt. of hydrocarbon always formed, treated with ice and 5% H_2SO_4 till acid, the oil taken up in Et_2O, washed free of H_2SO_4 with H_2O, dried with $CaCl_2$ and distd. *in vacuo*. The pure (*a*) b_{14} 139–40°, $d_4^{18.5}$ 1.0446, d_4^{20} 1.043, *n* 1.49024, 1.49384, 1.50331, 1.51158 for α, D, β and γ, resp., at 18.5°, n_D^{20} 1.4927, EΣ 0.13, 0.14, 14%, 15% for α, D, $\beta - \alpha$ and $\gamma - \alpha$. Expts. with the Br addition products and with oxidizing agents either confirmed the earlier

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work or gave no decisive results. The *1,4-dimethyl-1-cyclohexene-3-carboxylic acid* (*c*), from (*a*) in 30 parts boiling AmOH treated with 2-3 parts Na, short prisms mixed, on slow crystn., with rhombohedrons and long pointed columns from petr. ether, m. 71°, b_{14-8} 136–8°, b. 244°. *Methyl ester*, from the Ag salt and MeI, b_{12} 77.5–9.5°, b. 200°, $d_4^{19.0}$ 0.9708, d_4^{20} 0.970, n 1.45656, 1.45922, 1.46585, 1.47142 for α, D, β, γ at 19°, n_D^{20} 1.4588, EΣ 0.01, —0.01, 1%, 1% for α, D, $\beta-\alpha$, $\gamma-\alpha$. From 7.5 g. of the acid in ice-cold soda slowly treated with 1 l. of 2% $KMnO_4$, filtered, acidified and extd. with Et_2O is obtained an oily acid which is distd. *in vacuo*, boiled with H_2O and evapd. over H_2SO_4; this leaves an oil yielding a *p-nitrophenylhydrazone*, orange crystals from MeOH, m. 194–5°, of a *keto acid*, $C_8H_{14}O_3$. The reaction may be represented thus: (*c*) ⟶ $AcCH_2CH_2CHMeCH(CO_2H)_2$ ⟶ $AcCH_2CH_2CHMeCHCO_2H$. To the various methods of obtaining 1,4-dimethyl-1,3-cyclohexadiene (*b*) already reported may be added the following: 6 g. (*a*) are heated 1.5 hrs. at 120–5° in a H atm., the hydrocarbon all distg. over (temp. of the vapors, 95°); after standing some time over freshly ignited potash it b. 135–6° in H; again, the Me ester of (*a*) in $CHCl_3$ is treated with an equimol. amt. of Br, evapd., taken up in Et_2O satd. with H_2O, treated with Na wire, allowed to stand 14 hrs., filtered and distd. *in vacuo*, (*b*) being the only product. All the samples prepd. by the different methods had approx. the same consts.: b. about 136°, d_{20} 0.833–0.834, n_D^{20} 1.478–1.480, EΣ 0.63–0.80, and 37–44% for D and $\gamma-\alpha$. Treated in ice-cold CS_2 with not quite 1 mol. Br (previously dried with H_2SO_4) in CS_2, freed from CS_2 in CO_2, gently boiled 2 hrs. in 10 parts $PhNEt_2$ and poured into dil. H_2SO_4, it gives *p*-xylene, purified by distn. *in vacuo*, treatment with cold 1% $KMnO_4$ and steam distn. Just as with $KMnO_4$, so with O_3 in AcOH (*b*) gives $(CH_2Ac)_2$ in varying amts., the yield probably depending on the length of reaction, concn. of the O_3, temp., etc. The next higher homolog of (*a*), *1-methyl-4-ethyl-1,3-cyclohexadiene-3-carboxylic acid*, prepd. in the same way as (*a*), could not be entirely freed of a small amt. of impurity containing Cl; it b_{12} 152.5–3.0°, $d_4^{14.9}$ 1.0283, d_4^{20} 1.024, n 1.49496, 1.49887, 1.50831, 1.51684 at 14.8° for α, D, β and γ, n_D^{20} 1.4965, EΣ 0.36, 0.38, 18%, 20% for α, D, $\beta-\alpha$ and $\gamma-\alpha$. When the crude *4-isopropyl acid* is distd. *in vacuo*, the 1st fractions consist in large part of the corresponding hydrocarbon, 1-methyl-4-isopropyl-1,3-cyclohexadiene (*d*); the middle fractions are oily but deposit some solid on cooling strongly; the final fractions solidify in part or wholly; this seps. from low boiling petr. ether in crystals, m. 83–4°, b_{12} about 170°, not attacked by Na-Hg even at boiling temp.; *sodium salt*, pearly leaflets; *silver salt*, quite stable; *ethyl ester*, b_{11} 128°, $d_4^{17.0}$ 0.9772, d_4^{20} 0.975, n 1.49592, 1.50010, 1.51100, 1.52074 at 16.9° for α, D, β and γ, n_D^{20} 1.4987, EΣ 0.86, 0.92, 43%, 45% for α, D, $\beta-\alpha$ and $\gamma-\alpha$. These considerable exaltations, as compared with the low values for the ester of (*a*), might be due to differences in structure of the 2 acids, but it may also be due to Me and iso-Pr groups having different optical effects in these compds. and A. and H. are inclined to believe that the 2 acids are true homologs. The iso-Pr acid loses CO_2 only with difficulty, and the (*d*) was, therefore, prepd. from the ketone which is formed in the prepn. of the acid; 200 g. of this ketone gave 15 g. (*d*); the consts. of (*d*) (*C. A.* **9**, 996) confirm the earlier view that it is a true homolog of (*b*) and the 4-Et compd. and hence that it is identical with α-terpinene. When 5 g. are treated 3 hrs. in AcOH with O_3 and the ozonides are decompd., distd. *in vacuo* and then with steam there is obtained an oil which, shaken in Et_2O with soda and dried, gives about 1 g. of $Me_2CHCOCH_2CH_2Ac$, b_{16} 90–1°, $d_4^{23.0}$ 0.9336, d_4^{20} 0.936, n 1.42942, 1.43168, 1.43758, 1.44254 at 23.0° for α, D, β and γ, n_D^{20} 1.4330, EΣ 0.21, 0.20, 2%, 3% for α, D, $\beta-\alpha$ and $\gamma-\alpha$.

CHAS. A. ROUILLER.

Unsaturated hydroaromatic acids. K. v. AUWERS AND W. TREPPMANN. Greifswald and Marburg. *Ber.* **48**, 1377–88(1915); cf. *C. A.* **5**, 505.—When $CH_2.CHMe.CH_2.CMe:CH.C:CHCO_2Me$ in soda is slowly treated in a CO_2 atm. with

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about 4 times the calcd. amt. of 2% Na-Hg and allowed to stand 2 days at room temp. it gives 50–60% of an *acid* (*a*), $C_{10}H_{16}O_2$, oil, does not cryst. at —18° or on scratching, adds 1 mol. Br in $CHCl_3$, $b_{2.5}$ 119–20°, $d_4^{17.4}$ 0.9958, d_4^{20} 0.994, *n* 1.47476, 1.47790, 1.48506, 1.49130 for *α*, D, *β* and *γ* at 17.8°, *n* $^{20}_{D}$1.4769 (samples prepd. by reduction in hot soln. and by sapon. of the amide (see below) showed practically the same consts.), EΣ 0.30, 0.31, 6%, 5% for *α*, D, *β* — *α* and *γ* — *α*. *Ethyl ester*, from the acid with alc. and H_2SO_4, $b_{12.5}$ 114–5.4°, $d_4^{20.2}$ 0.9375, d_4^{20} 0.938, *n* 1.45481, 1.45753, 1.46416, 1.46965 for *α*, D, *β* and *γ* at 20.3°, n_D^{20} 1.4577, EΣ 0.22, 0.23, 4%, 3% for *α*, D, *β* — *α* and *γ* — *α*. *Amide*, obtained through the chloride (from the acid and $SOCl_2$), leaflets from C_6H_6, m. 152–4°, yields (*a*) after 2 days' boiling with alc. NaOH. To det. whether (*a*) was really *1,3-dimethyl-4-cyclohexenyl-5-acetic acid*, $CH_2.CHMe.CH_2.CHMe.CH:CCH_2CO_2H$ (*b*), the latter was prepd. in another way. *Ethyl 1,3-dimethyl-5-cyclohexanol-5-acetate*, obtained in 90% yield from 1,3-dimethylcyclohexanone, Zn and $BrCH_2CO_2Et$ in C_6H_6, b_{18} 137.5–9.0°, $d_4^{14.9}$ 0.9895, d_4^{20} 0.985, *n* 1.45442, 1.45664, 1.46269, 1.46777 at 14.9° for *α*, D, *β* and *γ*, n_D^{20} 1.4543, EΣ 0.15, 0.15, 5%, 4% for *α*, D, *β* — *α*, *γ* — *α*; heated 3 hrs. at 160° with 2 parts $KHSO_4$ it gives 82% of the *ethyl ester* of (*b*), b_{14} 116°, $d_4^{13.15}$ 0.9418, d_4^{20} 0.936, *n* 1.45796, 1.46098, 1.46774, 1.47354 at 13.3° for *α*, D, *β* and *γ*, n_D^{20} 1.4580, EΣ 0.26, 0.29, 8%, 7% for *α*, D, *β* — *α* and *γ* — *α*. Heated 1 hr. on the H_2O bath with excess of NaOEt, it gives (*b*) which, unlike (*a*), solidifies and seps. from low boiling petr. ether in leaflets, m. 56–7°; otherwise (consts. in the supercooled state, and properties of the ester and amide) it is identical with (*a*) and A. and T. conclude that (*b*) is the main product of the reduction of the methene acid. (*b*) b_{16} 150–1°, $d_4^{12.0}$, d_4^{20} 0.993, *n* 1.47762, 1.48047, 1.48825, 1.49468 at 11.4° for *α*, D, *β* and *γ*, n_D^{20} 1.4766, EΣ 0.33, 0.32, 10%, 9% for *α*, D, *β* — *α* and *γ* — *α*. As it was possible that the dehydration product of the hexanol ester might, instead of (*b*), be *1,3-dimethylcyclohexylidene-5-acetic acid* or *1,3-dimethylcyclohexane-5-methenecarboxylic acid* (*c*), although the formation of such a compd. would be exceptional and the product, in such a case, ought to show exaltations of 0.8–1.0 in the sp. refraction and of 30–40% in the sp. dispersion, (*c*) was prepd. as follows: The hexanol ester is hydrolyzed by warming with the calcd. amt. of alc. NaOEt to the free *acid*, prisms from benzine, m. 97–8°; 5 g. of this boiled 3 hrs. with 6 g. Ac_2O gives 66% of (*c*), prisms from dil. MeOH, m. 126°. *Methyl ester*, from the Ag salt and MeI, b_{14} 113–3.4°, $d_4^{15.15}$ 0.9568, d_4^{20} 0.953, *n* 1.47252, 1.47628, 1.48477, 1.49251 at 15.0° for *α*, D, *β* and *γ*, n_D^{20} 1.4740, EΣ 0.90, 1.01, 33%, 33%. *Ethyl ester*, b_{16} 126–8°, $d_4^{18.25}$ 0.9426, d_4^{20} 0.941, *n* 1.46902, 1.47307, 1.48079, 1.48825 at 18.25° for *α*, D, *β* and *γ*, n_D^{20} 1.4723, EΣ 0.84, 0.91; 29%, 30%. When the crude product obtained from 1,3-dimethyl-3-cyclohexene-5-one, Zn and $MeCHBrCO_2Et$ is heated 3 hrs. at 160° with 2 parts $KHSO_4$, the chief product (70% yield) is *ethyl α-[1,3-dimethylcyclohexylidene]-5-propionate*, $CH_2.CHMe.CH_2.CMe:CH.C:CMeCO_2Et$, b_{12} 136–8°, $d_4^{18.6}$ 0.9703, d_4^{20} 0.969, *n* 1.50227, 1.50753, 1.52136, 1.53443 at 18.7° for *α*, D, *β* and *γ*, n_D^{20} 1.5069, EΣ 1.41, 1.52, 80%, 87% for *α*, D, *β* — *α* and *γ* — *α*. On the other hand, the product from the ketone and Me_2CBrCO_2Et, heated with $KHSO_4$ at 180–90°, gives a good yield of *ethyl α-[1,3-dimethyl-3,5-cyclohexadienyl]-5-isobutyrate*, $CH:CMe.CH_2.CHMe.CH:CCMe_2CO_2Et$, b_{20} 141–2°, $d_4^{13.6}$ 0.9687, d_D^{20} 0.967, *n* 1.48406, 1.48735, 1.49630, 1.50372 at 15.0° for *α*, D, *β* and *γ*, n_D^{20} 1.4865, EΣ 0.37, 0.39, 20%, 22%. Free *acid*, from the ester boiled 4 hrs. with somewhat more than the calcd. amt. of NaOEt, 6-sided tables from petr. ether, m. 114–5°. C. A. ROUILLER.

Hydroaromatic cyanohydrins and α-hydroxycarboxylic acids. K. v. AUWERS AND F. KROLLPFEIFFER. Marburg. *Ber.* 48, 1389–97(1915).—1-Cyclohexanol-1-carboxylic acid is obtained in 95% yield by treating 15 g. cyclohexanone with 5 g. abs.

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HCN (Ultée, *C. A.* 3, 1536) and boiling the resulting brown-yellow oil 0.5 hr. with 50 g. concd. HCl. The Et ester can be obtained instead of the free acid by satg. the nitrile (from 65 g. ketone) in 400 cc. abs. alc. with HCl at 0°, allowing to stand at room temp. overnight, boiling 5 hrs., filtering, freeing from alc., adding H_2O, taking up the dark red oil in Et_2O, shaking with concd. aq. K_2CO_3, drying with Na_2SO_4 and distg. *in vacuo;* yield, 60 g., b_{13} 96–7°, seps. from low boiling petr. ether in long, slender, silky needles, m. 20–2°; on solidifying it first forms long prisms passing into the needles on long standing. It shows $d_4^{17.0}$ 1.0471, d_4^{20} 1.044, n 1.45418, 1.45675, 1.46222, 1.46700 at 17.0° for α, D, β and γ, n_D^{20} 1.4554, $E\Sigma$ —0.01, 0.01, 3%, 0% for α, D, $\beta-\alpha$ and $\gamma-\alpha$. From the 1st distn. of the above ester there remains 14 g. of a cryst. residue which seps. from AcOEt in needles, m. 128–9°, and is the amide. *1-Methyl-2-cyclohexanone cyanohydrin*, from the ketone, HCN and a drop of KCN, faintly yellowish oil, cannot be distd. in the vacuum of a H_2O pump without decompn.; all attempts to hydrolyze it to the acid or ester were fruitless, NH_4Cl being formed in various cases, to be sure, but the reaction products regularly consisted of mixts. of indifferent substances, doubtless chiefly unchanged ketone and its condensation products. *1,3-Dimethyl-5-cyclohexanol-5-carboxylic acid*, in 1.4 g. yield from the nitrile (from 6 g. ketone) boiled 1 hr. with 20 g. concd. HCl, leaflets with fatty luster from benzine, m. 124–5°. In attempting to dehydrate 1-cyclopentanol-1-carboxylic acid (*a*), P_2O_5 without a diluent was found to act too violently while in boiling Et_2O there was no reaction, but in hot C_6H_6 with 0.5 part P_2O_5 10% of the pentene acid was obtained; with boiling Ac_2O no H_2O could be split off. The *ethyl ester* (*b*) of (*a*) heated 5–6 hrs. at 170–80° with 1.5 parts $KHSO_4$ gives a good yield of pentene ester. (*b*), from (*a*) with alc. and H_2SO_4, b_{20} 99°, $d_4^{16.1}$ 1.0603, d_4^{20} 1.057, n 1.44897, 1.45160, 1.45693, 1.46171 at 16.0° for α, D, β and γ, n_D^{20} 1.4498, $E\Sigma$ 0.02, 0.04, 3%, 1% for α, D, $\beta-\alpha$ and $\gamma-\alpha$. Me ester, b_{16} 85°, $d_4^{17.4}$ 1.1043, d_4^{20} 1.102, n 1.45445, 1.45672, 1.46237, 1.46707 at 17.0° for α, D, β and γ, n_D^{20} 1.4554, $E\Sigma$ 0.01, 0.01, 2%, —2% for α, D, $\beta-\alpha$ and $\gamma-\alpha$. In dehydrating Et 1-cyclohexanol-1-carboxylate $KHSO_4$ at 170–80° reacts with much greater difficulty than with the pentanol deriv. and the reaction product polymerizes considerably more during the heating; $ZnCl_2$ at 150° has almost no action; P_2O_5 reacts violently at first, and later can be heated on the H_2O bath, but no pure unsatd. ester could be obtained; $POCl_3$ works better but a considerable portion of the product resinifies; $SOCl_2$ in C_5H_5N yields about equal parts of hexanol and hexene acids; with 1.5 parts PCl_5, the reaction being completed by heating 15–30 min. on the H_2O bath, there is obtained quite a good yield of the hexene ester, although it still contains about 0.7% Cl which cannot be removed by boiling with $PhNMe_2$ or distg. over Ag powder; the free hexanol acid and concd. H_2SO_4 evolve much CO, leaving a residue consisting chiefly of cyclohexanone with a little of the hexene acid; when 8 g. of the hexanol ester, instead of the acid, is allowed to stand 24 hrs. with H_2SO_4, no CO is evolved; the mixt. poured upon ice gives a semisolid mass which, shaken in Et_2O with soda, yields 1–2 cc. of an oil, while H_2SO_4 ppts. from the soda 2 g. of the hexene acid. The hexanol nitrile with $POCl_3$ gives only tarry products, while with $KHSO_4$, concd. H_2SO_4 or P_2O_5 and subsequent hydrolysis are obtained chiefly either reformed hexanol acid or a nitrogenous substance, m. 196–7°, while the unsatd. acid is formed in only very small amts. The nitrogenous compd. is formed in largest amt. with cold concd. H_2SO_4 and seps. from alc. in needles, easily sol. in alkalies, stable towards cold $KMnO_4$, unchanged by boiling alkalies but hydrolyzed to the hexanol acid and NH_3 by concd. HCl. 1-Methyl-2-cyclohexanol 2-nitrile gave similar results except that it yielded no substance corresponding to the above nitrogenous compd. CHAS. A. ROUILLER.

Mechanism of the coupling of diazonium salts with amines, phenols and phenol ethers. P. KARRER. Frankfurt a/M. *Ber.* 48, 1398–406(1915).—*Dipropyl-p-*

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phenylenediamine is obtained as the *hemisulfate*, $H_2NC_6H_4NPr_2.0.5H_2SO_4$, leaflets from alc., turns reddish in the air, by treating $ONC_6H_4NPr_2$ in warm H_2O with hydrosulfite until decolorized, making strongly alk. with concd. NaOH, extg. with Et_2O, drying with Na_2SO_4, adding 0.5 mol. H_2SO_4 and allowing to stand some time. $PhNBu_2$ and $(iso\text{-}Am)_2NPh$, however, cannot be nitrosated, but they couple easily, especially in AcOH, with diazonium salts; in this reaction, however, 1 of the alkyl groups is split off. Thus, 10 g. $PhNBu_2$ in 30 cc. AcOH treated at room temp. with 10 g. diazosulfanilic acid, stirred 2 hrs., taken up in 100 cc. H_2O and made strongly alk. in the cold with concd. NaOH gives *sodium butylaminoazobenzenesulfonate*, from the aq. soln. of which HCl ppts. the free red *acid*, while with hydrosulfite in warm H_2O is obtained *butyl-p-phenylenediamine*. In the same way is obtained *sodium isoamylaminoazobenzenesulfonate*, leaves from alc.; *isoamyl-p-phenylenediamine*, leaves, m. 31–2°; *dihydrochloride*, leaves. K. believes that in the coupling of diazonium salts with amines, there is first an addition of the diazo compd. to the N, with formation of an ammonium salt. The heavier the alkyl residues attached to the amine N, the more nearly satd. is the affinity of the N and the less there is of it remaining for addition, so that the coupling proceeds less easily; if the alkyls are too large (Bu, Am), the coupling either does not take place at all or only after 1 of the alkyls has been split off. The evidence in favor of this view, as against Meyer's (*C. A.* **8**, 2878), is discussed. K. believes the coupling with phenols and phenol ethers is similar, the 1st stage being the formation of an oxonium compd. CHAS. A. ROUILLER.

Keto-enol equilibria of oxaloacetic acid, its esters and salts. A. HANTZSCH. *Ber.* **48**, 1407–22(1915); cf. Meyer, *C. A.* **7**, 993, 1774.—On the approx. true assumption that the enol form of the esters of oxaloacetic acid (*a*) is optically identical in the ultraviolet with the structurally unchangeable enol ester di-Et ethoxyfumarate (*b*), $EtO_2CC(OEt):CHCO_2Et$, and the keto form is identical with the unchangeable keto esters di-Et dialkyloxaloacetates (*c*), $EtO_2CCOCR_2CO_2Et$, the % of enol form (p_e) in a mixt. can be calcd. from the formula $p_e = 100\, d_e(d_k - d_m)/d_m(d_k - d_e)$, where d_e is the depth of layer in mm., referred to a 0.0001 *N* soln., at which (*b*) becomes transparent, d_k is the corresponding depth of layer for (*c*) and d_m is the depth of the mixt. The solid di-Me ester, m. 74°, and the oily di-Et ester of (*a*) are optically as good as identical in all solvents, with a single exception discussed later. Contrary to Baly and Desch (*J. Chem. Soc.* **89**, 502(1906)), these esters show faint selective absorption in all media and they absorb throughout more strongly than but entirely similarly to the corresponding acetoacetic esters. (*b*) absorbs much more strongly (in the neighborhood of 4000 $\mu\mu$, more than 100 times) than (*c*); of the latter, the *gem.*-Me_2 compd. (*c*, R = Me) is more transparent than and not, as was to be expected, almost identical with the *gem.*-Et_2 deriv. While (*b*) and (*c*) show practically the same absorption in all solvents, the absorption of the esters of (*a*) is strongly influenced by the nature of the solvent, the keto form increasing with the dielectric const., *i. e.*, in the order: C_nH_{2n+2}, Et_2O, EtOH, MeOH, H_2O, (H_2O + HCl). The solns. in petr. ether and Et_2O show the max. of absorption, the curves being practically identical and very similar to that for (*b*). The minimum absorption is shown in dil. HCl but does not drop to that of (*c*); that in this medium the esters of (*a*) exist in practically only the keto form, however, is indicated by the fact that while the absorption of the aq. soln. is, to be sure, somewhat diminished by adding a little acid, further addition of acid produces no further diminution; and moreover, as shown above, (*c*, R = Et) absorbs less than (*c*, R = Me), although both are fixed keto compds. The % of enol in the series of solvents given above are 100, almost 100, 39, 4.5, 0.5, 0%, resp. The Et ester of (*a*) differs from the Me ester only in that its aq. soln. does not become somewhat more transparent on the addition of acid but remains const. The results obtained by this optical method

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differ considerably in some respects from those obtained by M. with his Br method. The Na salts of the esters of (*a*), studied in soda soln., show the enol type of absorption, naturally, but the absorption is shifted some 300$\mu\mu$ towards the red; it is not only markedly influenced by the solvent but also differs according as the Me or Et ester salt is taken. The absorption of the salt of the Et ester in $CHCl_3$ and C_6H_6 is markedly strong; this may be related with the fact that according to f. p. detns. it is highly associated (at least octo- and perhaps decamol.) in these solvents. The optical differences between aq. and MeOH solns. and between solns. of the salts of the Me and Et esters, which cannot be explained by differences in the degree of association, may be due to soln. equil. of 2 structurally isomeric salts, $RO_2CC(OM):CHCO_2R$ and $RO_2CCOCH:C(OM)OR$. Free (*a*) absorbs like its esters but somewhat more strongly in ketonizing media (dil. HCl) and more faintly in enolizing media (Et_2O); the % of enol in Et_2O, EtOH, H_2O, dil. HCl is about 100, 63, 3, almost 0, resp. The trimetallic salts (solns. of the acid in excess of alkali; the *tribarium salt* has been isolated) absorb very much like the salts of the esters; the mono- and dialkali salts (solns. of the acid in 1 and 2 mols. alkali) absorb like (*c*). Of the 2 forms of the Me ester of (*a*) described in the literature, that m. 84° (Michael and Murphy, *Ber.* **39**, 203(1906)) could not be obtained in spite of numerous attempts, and M. reports that he also has been unable to repeat its prepn. Of the 2 forms of (*a*), the labile modification is optically identical with the ordinary form even in Et_2O at —80°. A further proof that enol formulas must be amplified to cyclic secondary valence formulas, like $\begin{matrix} HO_2CC:CH.COH, \\ | \quad\quad || \\ OH\ldots O \end{matrix}$ lies in the entirely different optical effect of the introduction of the 1st and 2nd HO group; in passing from the very transparent fumaric or maleic acid to hydroxyfumaric acid (enol form of (*a*)), the absorption is changed in nature and greatly increased, but on going further to the so-called dihydroxymaleic (perhaps dihydroxyfumaric) acid, the absorption is only gradually shifted; the 1st material change is due to the ring formation. H. gives his reasons for believing that the spectrometric method gives more reliable results than the Br titration method. CHAS. A. ROUILLER.

Mercury double salts of aromatic tellurides. KARL LEDERER. Brüssel. *Ber.* **48**, 1422–5(1915); cf. *C. A.* **8**, 1249.—The following $HgBr_2$ compds. were obtained by shaking the telluride in Et_2O with aq. $HgBr_2$, the HgI_2 compds. from the telluride and an equiv. amt. of HgI_2 in alc. *Diphenyl telluride-mercuric bromide*, felted needles from AcOH, yellowish needles from alc., sinters 143°, m. 148°. *Iodide*, golden yellow needles from alc., sinters 140°, m. 146°; the crystals from AcOH m. 4–5° lower. *Di-o-tolyl telluride-mercuric bromide*, elongated plates from AcOH, fine needles from alc., sinters 195°, m. 199–200°. *Iodide*, S-yellow scales from alc., microscopic S-yellow needles from AcOH, m. 142–3°. *Di-p-tolyl telluride-mercuric bromide*, yellowish resin from alc. and AcOH, sinters 64°, m. about 85°. *Iodide*, S-yellow resin from alc., softens 50°, m. 65°. *Di-p-anisyl telluride-mercuric chloride*, brown, amorphous substance which cannot be recrystd. *Bromide*, yellowish brown, amorphous substance. Basic Hg″ cyanide, thiocyanate and sulfate in H_2O do not form double salts with Ph_2Te in Et_2O; the nitrate gives a resinous double salt; in boiling alc. are obtained oily double salts on cooling; neutral $HgSO_4$ shows no tendency to double salt formation. *Di-p-tolyl telluride-basic mercuric nitrate*, $C_{14}H_{15}TeHgNO_4$, white ppt. C. A. R.

Valence of sulfur. II. Thiophenolmercury (mercuric thiophenolate). H. LECHER. Acad. Sci. Munich. *Ber.* **48**, 1425–32(1915); cf. *C. A.* **9**, 1779.—To further test the correctness of the theory that the change in color observed on heating certain S compds. is due to a gradual weakening of the S-S union, a compd. was taken which dissociates on heating, *viz.*: $(PhS)_2Hg \longrightarrow (PhS)_2 + Hg$ (Dreher and Otto, *Ann.*

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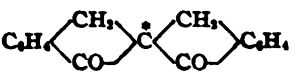
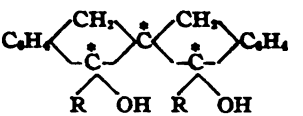
154, 178(1870)). The $(PhS)_2Hg$ is obtained in 9.1 g. yield from 5 g. PhSH in 60 cc. C_5H_5N shaken a few times in a closed flask with 6 g. yellow HgO, filtered and pptd. with 2 vols. of H_2O; it seps. from C_6H_6 in colorless felted needles, which are silky and have a faintly greenish yellow luster when in large amts., gradually becomes yellow on heating, sinters 151°, m. 152.5–3.5° with partial decompn. (sepn. of Hg) to a yellow liquid, becomes strongly electrified on rubbing. The substances which has been turned yellow by heating to 125° again becomes colorless on cooling, has the same m. p. as before and dissolves clear in C_5H_5N; a suspension in H_2O likewise becomes yellow on boiling and colorless on cooling and the same is true of all its solns.; a 10% C_5H_5N soln. 2 cm. thick absorbs the violet end of the spectrum up to about 0.415μ at room temp. and 0.430μ at 110°. Dissociation plays no role in these phenomena; only on long boiling does Hg sep. The C_5H_5N soln. is practically non-conducting, the resistance of a 0.1 *N* soln. being to that of 0.1 *N* $AgNO_3$ as more than 200,000 is to 107. A study of the reaction $(PhS)_2Hg \longrightarrow (PhS)_2 + Hg$ showed that it is reversible; to sep. the constituents of the resulting mixt., it is warmed, with addition of C_6H_6 if necessary, until all the $(PhS)_2Hg$ is dissolved, filtered from the Hg (which is washed with C_6H_6 and Et_2O and weighed), evapd. *in vacuo*, the $(PhS)_2$ dissolved out with petr. ether and the $(PhS)_2$ and $(PhS)_2Hg$ weighed. From 1.0 g. $(PhS)_2$ and 4.4 g. Hg heated 23 hrs. in 100 cc. boiling xylene are obtained 0.93 g. $(PhS)_2$ and 0.13 g. $(PhS)_2Hg$; 2.0 g. $(PhS)_2Hg$ heated 22 hrs. gave 0.16 g. Hg, 0.17 g. $(PhS)_2$ and 1.7 g. $(PhS)_2Hg$. From 2 g. Hg and 2.18 g. $(PhS)_2$ heated with shaking in 50 cc. C_6H_6 at 200° were obtained 1.85, 2.04 and 0.27 g. Hg, $(PhS)_2$ and $(PhS)_2Hg$ after 3 hrs. and 1.86, 2.03 and 0.29 g., resp., after 6 hrs., while the yields from 4.18 g. $(PhS)_2Hg$ similarly treated were 1.60, 1.77 and 0.80 g. after 3 hrs. and 1.84, 2.03 and 0.29 g. after 6 hrs. When 5.25 g. $(PhS)_2Hg$ are distd. under 11 mm., $(PhS)_2$ and Hg pass over when the temp. of the bath reaches 211° and distn. stops at 240°; the residue is bright Hg and the distillate consists of $(PhS)_2$ and Hg; yields, 2.35 g. Hg, 2.55 g. $(PhS)_2$ and 0.3 g. sublimed $(PhS)_2Hg$. C. A. R.

Spiranes. VII. Ring formation in spiranes. HERMANN LEUCHS AND LUDWIG LOCK. Univ. Berlin. *Ber.* 48, 1432–43(1915); cf. *C. A.* 9, 84, 2381.—According to the views earlier developed, a compd. of the type (I) on adding H or reacting with

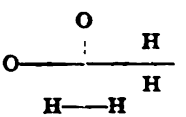


(I)



(II)

Grignard reagents should give compds. (II) capable of existence in 3 stereoisomeric forms. In the 2 cases tried, only 1 form was obtained, indicating that spatial relations exert a strong influence. The probable constitution of the isomer formed is deduced by L. and L. thus: The planes of the 2 rings of (I) are perpendicular to each other and, when prolonged, bound 4 spaces, as shown by the projection (III), the



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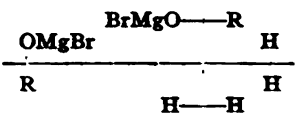

(IV)

point of intersection representing the spirane C atom and only the substituents of the 5-membered ring being shown. The entering residues (R) will find most room in the diagonal spaces, and the BrMgO residues will therefore be in the same space (IV) and, as can be seen on a model, will be very close together. The ease with which the

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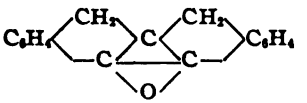
resulting alcs. form anhydrides harmonizes with this view. The racemic form of the compd. in which the arrangement around the 2 asym. atoms is the same and the HO groups are close together is designated as *syn-dd-ll*, the isomer in which the HO groups are not close together as *diag-dd-ll*, and the 3rd isomer, in which the arrangement about the asym. atoms is different, as *vic-dl-ld* or simply *dl-ld*. As to the R's (= Ph) it is assumed that their planes are perpendicular to that of the spirane



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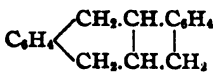

(VI)

ring to which they are attached and are probably parallel to the other spirane plane, as they best find place in such an arrangement. From 0.49 g. Mg powder, 2.53 g. $PhCH_2Cl$ and a trace of EtBr boiled 2 hrs. in 200 cc. Et_2O in a current of H, then treated with 2.48 g. (I) in 20 cc. C_6H_6, boiled 1 hr., poured upon ice, treated with dil. H_2SO_4, the ppt. extd. with $CHCl_3$, evapd. and freed from resins by dissolving in warm C_6H_6 and pptg. with petr. ether, are obtained 2 fractions: (*a*), 2.1 g., and (*b*), 0.9 g. (*a*) is *syn-bis-α-benzyl-α-hydroxyhydrindene-β,β-spirane* (II, R = $PhCH_2$), prismatic needles with 3 H_2O from alc., loses its H_2O *in vacuo* over H_2SO_4, again loses in wt., probably with decompn., at 132°, sinters 159°, m. 167–9°, sol. in 20 parts hot alc., gives with H_2SO_4 a yellow soln. finally becoming red. (*b*) is *α-hydroxy-α-benzylhydrindenehydrindone-β,β-spirane* (I, in which only one O atom has reacted), 6-sided leaflets from alc., sinters 174°, m. 180–2°, gives with H_2SO_4 a green color soon changing to red. The C_6H_6-petr. ether filtrate from (*a*) and (*b*) yields 1.1 g. of the anhydride of (*a*), *syn-bis-α-benzylhydrindene-β,β-spirane α,α'-oxide*, seps. from alc. as an oil which later crysts., domatic prisms, m. 87–8°, gives a red-yellow color with H_2SO_4; it is also obtained in good yield by boiling (*a*) with 20 parts AcCl for 2 hrs. In the same way from 2.48 g. (*a*) with PhMgBr are obtained 2.9–3.4 g. *syn-bis-α-phenyl-α-hydroxyhydrindene-β,β-spirane*, massive rectangular prisms with 3 H_2O from alc., m. 125–30°, solidify and rem. 162–4°, needles with 1 H_2O from C_6H_6, begins to sinter 130°, m. about 149° (gas evolution), gives a red-yellow soln. with H_2SO_4. There is also formed 0.3 g. of the *α,α'-oxide*, obtained in 0.8 g. yield from 1 g. of the alc. with boiling AcCl, 6-sided tables from alc., m. 95°, gives a red-yellow soln. with H_2SO_4. The alc. heated 2 hrs. at 100° with AcOH and NaOAc is neither esterified nor dehydrated. To reduce (I), 6 g. of it, 60 cc. PhMe, 60 cc. concd. HCl, 30 cc. H_2O and 30 g. of Clemmensen's Zn-Hg (*C. A.* **8**, 1588) are boiled 4 hrs. with addition of small amts. of HCl, then decanted from the metal, the PhMe sepd. while hot and washed once with warm H_2O, and the aq. alk. soln. extd. with $CHCl_3$; the PhMe on cooling to —5° deposits 1 g. fine needles (*c*); the filtrate, mixed with the residue from the $CHCl_3$ ext., evapd. and taken up in 30 cc. Et_2O, gave in many expts. unchanged (I) (up to 2.4 g.), in others not a trace of it; the part sol. in Et_2O, on treatment with a little $CHCl_3$, gave 0.5 g. more of (*c*); it sinters and turns brown from 175°, m. 197–201° (more sharply, and without coloring, *in vacuo* at 210–1°), mol. wt. 253 in freezing C_6H_6. Its comp. is $C_{17}H_{12}O$ and it probably is *α,α'-dehydrobishydrindene-β,β-spirane α,α'-oxide* (V). The $CHCl_3$ filtrate from the above 0.5 g. crop of (*c*), on distn. under 15 mm., yields 2 g. of a hydrocarbon, probably *bishydrindene-β,β-spirane* (*d*), $C_{17}H_{16}$, rectangular prisms or tables from MeOH, m. 63°, depresses the m. p. of (*e*) (m. 67°; see below) to 35–40°; there is also obtained 0.05 g. of a compd. apparently identical with the hydrocarbon $C_{17}H_{12}$ below. When 6 g. of (I), 40 cc. HI (d. 1.96) and 1.5 g. red P are heated in sealed tubes up to 125° in the course of 2 hrs. and kept 3 hrs. at about 130°, taken up in H_2O, extd. with $CHCl_3$ and shaken with dil. aq. alkali, the latter on acidi-

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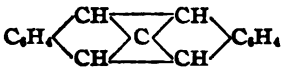
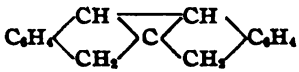
fication yields 0.2–0.8 g. of *β-[benzyl-o-carboxylic]hydrindene*, needles from C_6H_6, sinters 155°, m. 158–9°; the neutral products of the reduction, on distn. under 15 mm., give 2.8 g. b. 220° (*e*) and 0.5 g. b. 240–60° (*f*). (*e*) is an *isomer* of (*d*), needles or prisms from MeOH, mol. wt. in freezing C_6H_6 223, m. 66–7°. (*f*) contains 2 products in varying amts.; fractional crystn. from hot ligroin sometimes gave 0.05–0.10 g. of a *hydrocarbon* (*g*), $C_{17}H_{12}$, leaflets, m. 210°, mol. wt. in freezing C_6H_6 212, and 0.1–0.2 g. of a *compound* (*h*), $C_{17}H_{14}$, leaflets from acetone, m. 144°. Formulas (VI), (VII) and (VIII)



(VII)



(VIII)

are suggested for (*e*), (*g*) and (*h*), resp. **VIII. A new kind of rearrangement in oximes of certain ketones.** HERMANN LEUCHS AND HUBERT RAUCH. *Ibid* 1531–40.—In attempting to effect a Beckmann rearrangement, 2 g. *o*-$HO_2CC_6H_4CH_2\underline{CH.CH_2}.C_6H_4.C:NOH$ (*C. A.* **7**, 3330) were heated 1 hr. at 95° with 10 cc. AcCl, then poured into H_2O, which gave a ppt., the filtrate from which, after shaking with $CHCl_3$, yielded 0.2 g. NH_4Cl. The ppt., crystd. from alc. (yield, 0.7 g.) proved to be $O.CO.\underline{C_6H_4.CH_2}.\underline{C.CH_2}.C_6H_4.CO$ (*i*). If, instead of boiling, 2 g. of the oxime and 40 cc. AcCl are allowed to stand at room temp., the liquid in a few hrs. becomes yellow, the colorless oxime gradually disappears and is replaced by greenish yellow crystals (yield, 1.6 g. after 1–2 days), cannot be purified, begin to decomp. about 200°, m. 223° (decompn.), insol. or sol. only with decompn. in org. solvents, at once decompd. by cold H_2O, liberates no I from acidified KI; its comp. is $C_{17}H_{14}O_2NCl$ and it is probably *dihydroisocoumarin-1-hydrindoneimine-3,2-spirane hydrochloride*, $O.CO.\underline{C_6H_4.CH_2}.\underline{C.CH_2}.C_6H_4.C:NH.HCl$ (*j*), for 1.6 g. of it, digested 1 hr. with 80 cc. H_2O and treated with soda, gave 0.95 g. (*i*); the alk. filtrate, which contained NH_4Cl, gave on acidification 0.4 g. of a substance which appeared to be the oxime, probably present as an impurity in the ppt. of (*j*) or formed from some other substance, perhaps a stereoisomeric Ac deriv. Dil. HCl produces the same decompn. L. and R. therefore believe that the action of AcCl on the oxime consists in a direct interchange of HO or OAc for H: $>CH.C:NOR \longrightarrow >C(OR).C:NH$ (R = H or Ac). In the true Beckmann rearrangement of the oxime, effected by allowing 1.68 g. of it in 35 cc. $CHCl_3$ to stand 2 days with 2.52 g. PCl_5, $HO_2CC_6H_4CH_2\underline{CH.CH_2}.C_6H_4.C:NCl$ is probably formed, for on decompg. the ppt. with ice H_2O, extg. with $CHCl_3$ and crystg. from alc. there is obtained 0.4 g. of *1-hydrindonedihydrocarbostyril-2,3-spirane* (*k*), $\underline{CO.C_6H_4.CH_2}.\underline{C.CH_2}.C_6H_4.NH.CO$, 4-sided leaflets from AcOH, m. 268°, depresses to 210–30° the m. p., 255°, of the isomeric rearrangement product of bis-α-hydrindone-β,β-spirane oxime, and which is probably *1-hydrindonedihydroisocarbostyril-2,3-spirane*. From 1 g. (*k*) heated 5 min. at 160–70° with 30 cc. of 75% H_2SO_4, dild. with ice H_2O, filtered, dissolved in soda and repptd. with HCl is obtained *3-[benzyl-o-carboxylic]-dihydrocarbostyril*, $HO_2CC_6H_4CH_2\underline{CH.CH_2}.C_6H_4.NH.CO$, needles from AcOH, sinters 217°, m. 235° with loss of H_2O and formation of (*k*); the acid is also formed in 0.45 g. yield from 0.5 g. (*k*) heated 2.5 hrs. on the H_2O bath with 4 cc. of *N* NaOH. Bis-hydrindonespirane monooxime (0.5 g.), heated 1 hr. at 95° with 10 cc. AcCl, gave 0.45 g. of the *acetyl derivative*, $C_{19}H_{15}O_3N$, 4-sided tables from alc., turns yellow 180°, then brown and m. about 200–5°, insol. in dil. acids and alkalies; it seems, therefore, that

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the presence of H on the α-C atom, which perhaps must be tertiary, is necessary for the rearrangement described above with AcCl. That the reaction is not a so-called rearrangement of the 2nd class, $>CH.C:NOH \longrightarrow >CH(OH) \vdots C \vdots N$ is shown thus: *β-Benzyl-α-hydrindone oxime*, obtained in 10 g. yield from 10 g. of the ketone in 200 cc. alc. and 6.2 g. $NH_2OH.HCl$ in 8 cc. H_2O and 6.6 cc. 10 *N* NaOH boiled 2 hrs., fine needles from alc., m. turbid 122–3°, clear 131°, changes in the course of several weeks to a light brown resin; 3 g. treated at 0° with 30 cc. AcCl and allowed to stand 24 hrs. at room temp. gives 0.75 g. of a compd. $C_{16}H_{14}NCl$, probably *β-benzalhydrindoneimine hydrochloride*, $C_6H_4.CH_2.C(:CHPh).C:NH.HCl$, massive lemon-yellow prisms from MeOH, becomes colorless at 210° and gradually decomps., is extremely irritating to the mucous membrane, decompd. by aq. alc. on long boiling; the cold aq. soln. becomes turbid (sepn. of an oil) on warming or treating with soda; with acidified KI it gives a yellow color but no free I; 0.4 g. heated in H_2O 0.5 hr. on the H_2O bath yields 0.3 g. β-benzalhydrindone; the hydrolysis is also effected, but more slowly, by hot *N* HCl.

CHAS. A. ROUILLER.

Preparation of β-sulfidebutyric acid. HELMUTH SCHEIBLER. Berlin. *Ber.* 48, 1443–5(1915); cf. Lovén and Johansson, *C. A.* 9, 2650.—$MeCHClCH_2CO_2H$ is obtained almost quant. by satg. crotonic acid in Et_2O at 0° with HCl gas and allowing to stand 3 days at room temp. in pressure bottles; 20 g. of the Cl acid, neutralized in the cold with concd. K_2CO_3, are treated with 11 g. K_2S, slowly allowed to rize to room temp., allowed to stand 3 days at 37°, acidified with dil. HCl, extd. with Et_2O, evapd., treated several hrs. with steam, evapd. *in vacuo*, then evapd. several times with alc. and finally with Et_2O; the sirupy residue obtained by drying *in vacuo* at 50° (11.3 g.) consists not alone of a mixt. of L. and J.'s isomeric β-sulfidebutyric acids, for on esterification with MeOH and H_2SO_4 and distn. of the product were obtained 2 fractions: (1) b_{12} about 80°, has a mercaptan odor, gives the $FeCl_3$ reaction and is probably $MeCH(SH)CH_2CO_2Me$; (2) b_{12} about 170°, colorless and odorless, boils without decompn. With Na_2S instead of K_2S, the Cl acid gives only crotonic acid. An optically active *di-β-hydroxybutyric ester* (apparently the *methyl ethyl ester*—ABSTR.), b_{12} about 145°, α —18.2°, is obtained from 1 mol. each of Me crotonate and *l*-$MeCH(OH)CH_2CO_2R$ (the original does not state whether R = Me or Et) heated 5 hrs. at 120° with 0.1 atom of K.

CHAS. A. ROUILLER.

Unsaturated sulfidedicarboxylic acids. I. β-Sulfidedicrotonic acids. HELMUTH SCHEIBLER AND WALTHER BUBE. Berlin. *Ber.* 48, 1445–61(1915).—The Et β-chloroisocrotonate b. 158°, its stereoisomer b. 180° and the mixt. of the 2 obtained by Mamert's method (*Bull. soc. chim.* [3] 13, 70(1895)) heated in alc. with K_2S yield the same product but with varying ease, the same result being obtained after 5, 20 and 12–6 hrs. boiling, resp. Thus, 310 g. of the M. mixt. in 5 parts abs. alc. boiled 16 hrs. with 170 g. finely powdered K_2S, freed from alc., treated with a little H_2O, extd. with Et_2O, dried with Na_2SO_4 and distd. gave 143 g. *diethyl β-sulfidedicrotonate* (*a*), $S(CMe:CHCO_2Et)_2$ (which, since it is most easily formed from the Cl ester b. 158°, is probably the maleinoid form), $b_{0.2}$ 135–7°, b_4 150–3°, cannot be distd. without decompn. in the vacuum of a H_2O pump, is a thick, yellow oil, sol. in concd. HCl and H_2SO_4, gives no HCl in Et_2O nor a $HgCl_2$ compd. As by-product is formed *ethyl β-mercaptocrotonate;* to increase the yield of this, the Cl ester is slowly poured into KSH in boiling alc., filtered, evapd. *in vacuo* in a CO_2 atm., taken up in Et_2O, and shaken with aq. $Cu(OAc)_2$, which gives the *cuprous compound*, $C_8H_9O_2SCu$, as an amorphous yellow ppt. *Monoethyl β-sulfidedicrotonate*, obtained in 2.2 g. yield from 5 g. (*a*) in 8–10 parts alc. allowed to stand 24 hrs. at room temp. with 1.1 g. KOH, treated with CO_2 to combine with the excess

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of KOH, freed from alc. *in vacuo*, taken up in H_2O, freed from unchanged (*a*) with Et_2O, then from Et_2O with air, acidified to Congo with dil. H_2SO_4, the resulting yellow oil dissolved in $CHCl_3$, extd. from the latter with $NaHCO_3$ and repptd. with acids, oil soon solidifying, prisms from C_6H_6-petr. ether, alc. and H_2O, m. 104–5°, loses CO_2 at 210°. *Free acid*, from (*a*) allowed to stand 48 hrs. with a little more than 1 mol. alc. KOH, acidified, extd. with Et_2O or $CHCl_3$, evapd., treated with excess of 33% aq. KOH, dild. to 1.5 vols. with H_2O after soln. is complete, allowed to stand 2–3 days, acidified to Congo, filtered, boiled up twice with $CHCl_3$ to remove traces of the mono-Et ester, boiled in NH_3 with charcoal until only faintly yellow and pptd. with acid and finally from alc. with much H_2O, cryst. powder, m. 212–5° (CO_2 evolution), sol. in 25 parts alc. and 1000 parts H_2O at room temp., seps. from H_2O in long, slender, rhombic prisms, sol. in concd. H_2SO_4 with yellow color but the soln. soon becomes turbid (especially on warming) and evolves the odor of H_2S and SO_2; the soln. in 2 mols. of NH_3 gives white, green, white and yellow-red ppts. with $AgNO_3$, $Cu(OAc)_2$, $Pb(OAc)_2$ and $FeCl_3$, resp. *Disilver salt*, microcryst. prisms with 1 H_2O, cannot be recrystd., decompd. by hot H_2O, slowly turns bluish in bright daylight, decomps. about 115°. *Barium salt*, irregularly defined tables with 1 H_2O. *Copper salt*, light green, amorphous. *Dimethyl ester*, obtained in 4.5 g. yield from 10 g. of the acid and 2 g. concd. H_2SO_4 boiled 4 hrs. in 20 cc. MeOH, $b_{0.6}$ 116–7°, prisms, m. 23.5°, gives no $FeCl_3$ reaction. The *diamide*, microcrystals from alc. and petr. ether, rhombic prisms from H_2O, m. 192°, cannot be obtained directly from (*a*) but is formed in 2 g. yield when 4 g. of the free acid and 3.6 g. PCl_3 are kept at 40–50° until the reaction ceases, then a short time at 80–90°, cooled, rinsed from the H_3PO_3 with Et_2O, filtered and treated in a freezing mixt. with NH_3 gas. The acid boiled 10–15 min. with a large excess of Ac_2O, concd. at 100° under 20 mm., evapd. twice with $CHCl_3$ and dried, first over KOH and finally over P_2O_5 at 67° under 20 mm., gives the intramol. *anhydride* as a non-crystallizable oil. *Diethyl α,α-dichloro-β-sulfidodicrotonate*, from 20 g. (*a*) slowly added to 25 g. SO_2Cl_2 in cold Et_2O, boiled 3–4 hrs., evapd. at 85° *in vacuo*, shaken with $NaHCO_3$ until the evolution of CO_2 ceases and extd. with Et_2O, $b_{0.6}$ 165–6°, $b_{0.1}$ 158–60° (with some decompn.), yellow to dark yellow oil when freshly distd., darkens on standing, reacts quite slowly with H_2O and alc., although after some boiling the liquid gives a strong Cl reaction; NH_3 at room temp. at once produces a deepening of the color and after some time HCl exts. a basic product remaining as an oil when the HCl is evapd. off. The ester b. about 230° with intense evolution of gas (CO_2, HCl and H_2S were identified) and an oil of penetrating odor distils over. When (*a*) and the calcd. amt. of NaOEt in Et_2O and enough alc. to keep the NaOEt in soln. are allowed to stand some time in a H atm., the *disodium salt*, $C_{12}H_{16}O_4SNa_2$, of (*a*) seps. as a pulverulent yellow-red ppt.; with H_2O it at once loses its red color, the soln. becomes alk. and an oily turbidity is formed; with dil. HCl (*a*) is reformed; in damp air the salt resinifies. From $CHCl:CMeCO_2Me$ and 1.5 mols. K_2S boiled 10–11 hrs. in 5 parts MeOH is obtained, together with a considerable amt. of acid products and some mercapto ester, *dimethyl α,α-dimethyl-β-sulfidodicrotonate*, b_3 149–50°, gives no HCl salt in Et_2O and no $HgCl_2$ compd. The soda soln. of the acid products, acidified with HCl, extd. with $CHCl_3$, evapd., allowed to stand 3 days with aq. KOH and acidified gave the free *acid*, microcrystals from alc., m. 181° (decompn.). CHAS. A. ROUILLER.

Steric hindrance. G. REDDELIEN. Univ. Leipzig. *Ber.* 48, 1462–72(1915); cf *C. A.* 9, 1910.—R. produces exptl. evidence that the affinities of nearly related substances for another substance may be the same and yet that the velocities with which they react with this 2nd substance may be enormously different. Thus, PhBz, *p*-MeC_6H_4Bz, *o*-MeC_6H_4Bz and 3,5-$Me_2C_6H_3Bz$ form with HNO_3 (d. 1.40) well characterized addition products, $R.HNO_3$, hydrolyzed by H_2O into their components. If dil.

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HNO_3 is the hydrolytic agent, an equil. is established: $R.HNO_3 + H_2O \rightleftarrows R + HNO_3.H_2O$. Since the ketones and the ketone nitrates are easily sol. in each other but almost insol. in HNO_3, when the ketones are mixed with HNO_3, 2 sharply defined layers are formed, the lower consisting of almost pure HNO_3, the upper of the ketone-ketone nitrate soln., and by pipetting off the latter, weighing it and detg. its HNO_3 content, the % of ketone nitrate and, hence, the extent of the above hydrolysis can be detd. The following were the % of ketone nitrate found on digesting equimol. amts. of the 4 ketones above, resp., with HNO_3 of 3 concns. and allowing to stand in the dark with occasional vigorous shaking for 8 days: with HNO_3 of d. 1.4000, 101.4, 101.4, 100.9, 99.6; d. 1.362, 79.0, 81.1, 74.3, 75.4; d. 1.326, 63.5, 66.3, 57.5, 58.3. Conversely, on shaking 0.5–0.7 g. of the pure ketone nitrates with 10 cc. of HNO_3 (d. 1.326), the amts. of ketone nitrate in the upper layer after 8 days were found to be 67.0, 70.9, 60.3, 59.3%, resp. The 4 ketones therefore show approx. the same affinity for HNO_3, but the velocity with which they react with the acid is entirely different; if the first 3 are shaken once with HNO_3 (d. 1.40) and allowed to stand quietly, the reaction is complete in 1–3 hrs., while with the $Me_3C_6H_2Bz$ 5 weeks are required. When ketones are heated with aromatic amines at 200° in the presence of a small amt. of the corresponding HBr salts as catalysts, the anils are formed, but the anil formation is not complete, an equil. soon being established (cf. *C. A.* **8**, 104). Below are the % of anil formed in 10, 30 and 45 min., resp. $Ph_2C:NPh$, 60, 70, 71; *p*-$MeC_6H_3CPh:NPh$, 57, 66, —; *o*-$MeC_6H_4CPh:NPh$, 41, 69, 69; *o*-$MeC_6H_4N:CPh_2$, —, 63, —; 3,5-$Me_2C_6H_2N:CPh_2$, —, 56, 64. Here again, although the condensation leads to approx. the same equil., the velocity of reaction in each case is different, *o*-Me groups decreasing it. This is best shown in the reverse process, the hydrolysis of the colored anils to the colorless components. Thus, the times required for the decolorization at room temp. of equimol. alc. solns. of the above anils and also of *m*- and *p*-$MeC_6H_4N:CPh_2$, resp., treated with 0.1 *N* alc. HCl were 30–5 sec., 50–60 sec., 19–20 min., 4.5–5.0 min., 10.5–11.0 hrs., 35–40 sec., 50–60 sec. The much greater influence of the *o*-Me in the Ph of the ketone than in that of the amine is in excellent agreement with Pfeiffer's halochromism theory that the addition of H_2O in the hydrolysis occurs at the C, not the N, of the C:N union (*C. A.* **5**, 3581). The following new compds. were prepd. in the course of the work: *p-Tolyl phenyl ketone nitrate*, fine needles, m. 13°, sol. in $CHCl_3$ with light yellow color. *o-Tolyl isomer*, yellow oil, does not solidify at —30°. *Mesityl homolog*, becomes glassy but not cryst. on strong cooling. *p-Tolyl phenyl ketone anil*, heavy, bright yellow oil, b_{13} 233°, b_{16} 238°, becomes glassy at —10°. *Benzophenone o-tolil*, intensely yellow needles from alc., m. 50–1°. *Benzaldehyde mesil* (*benzalmesidine*), long, broad, faintly yellowish prisms from alc., m. 43°. *Benzophenone mesil*, deep yellow crystals from alc., m. 68°. 3,5-$Me_2C_6H_3Bz$ does not form an anil. CHAS. A. ROUILLER.

New heterocyclic systems. I. Piperidine analogs in which the nitrogen atom is replaced by phosphorus, arsenic, antimony or bismuth. GERHARD GRÜTTNER AND MAXIMILIAN WIERNIK. Charlottenburg. *Ber.* **48**, 1473–86(1915); cf. Bygdén, *C. A.* **9**, 2648.—The $PhPCl_2$ and *p*-$MeC_6H_4PCl_2$ were prepd. by Michaelis' method (*Ann.* **212**, 205) by boiling the hydrocarbon 36 hrs. with PCl_3 and $AlCl_3$ but the working up of the product was somewhat modified, thereby increasing the yield materially; the hydrocarbon is first distd. off under atm. pressure in CO_2, then the sirupy residue under 18–20 mm. up to 230°, also in CO_2, and this distillate is rectified *in vacuo*. In the prepn. of the Mg deriv. of $CH_2(CH_2CH_2Br)_2$ (*a*), the precautions recommended to insure a greater yield, *viz.*: greatly moderated reaction (*C. A.* **8**, 1120), were generally discarded, as in working with large amts. this would have rendered the process entirely too long. This made it necessary to use larger amts. of (*a*); in the following the values

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given in parentheses after the amts. of (*a*) used represent the amts. which would have been necessary if the aforesaid precautions had been used: *Cyclopentamethylene-phenylphosphine*, $CH_2.CH_2.CH_2.CH_2.CH_2.PPh$ (*b*), b_{22-4} 154–5°, b_{15-8} 143–4°, has a characteristic phosphine odor, does not fume and oxidize markedly in the air, strongly reduces neutral and faintly acid (HNO_3) $AgNO_3$, $d_4^{21.6}$ 1.0306, n_D^{20} 1.5886, $n_F - n_C^{20}$ 0.02096, mol. wt. in freezing C_6H_6 169, 185; it is obtained in 18 g. yield from the Mg compd. from 100 (75) g. (*a*) in 500 g. Et_2O treated with shaking and cooling with 50 g. $PhPCl_2$ in 3 vols. Et_2O, warmed 0.5 hr. on the H_2O bath, freed from Et_2O under atm. pressure in H, distg. the residue up to 360° *in vacuo* in H and fractionating the distillate *in vacuo* in CO_2. *Mercuric chloride compound*, $C_{11}H_{16}PHgCl_2$, from the components in dil. alc., thick ppt., m. about 172° (decompn.). *Ethiodide*, from the components boiled 0.5 hr. in alc., freed from alc., rubbed with ligroin and crystd. from alc.-ligroin, fine crystals, m. 188°. *Carbon tetrachloride addition product*, from (*b*) in Et_2O dropped into cold CCl_4, white ppt. with 15.37% directly precipitable Cl, more hygroscopic than P_2O_5. *Cyclopentamethylene-p-tolylphosphine*, in 17 g. yield from 45 g. *p*-$MeC_6H_4PCl_2$ and the Mg compd. from 100 (75) g. (*a*), b_{24} 167–8°, d_4^{20} 1.0007, $n_D^{22.2}$ 1.5729, $n_F - n_C^{22.2}$ 0.01981, mol. wt. in freezing C_6H_6 187, 192; treated in ligroin with Cl a *chloride* seps. in white crystals which, on further treatment with Cl, pass over into a faintly yellowish, quite unstable oil which, on distn. *in vacuo*, yields $CH_2(CH_2CH_2Cl)_2$. *Mercuric chloride compound*, needles from C_5H_5N and alc., m. 157°. *Carbon tetrachloride compound*. *Methiodide*, yellowish oil. *Ethiodide*, crystals from ligroin-alc., m. 163–4°. *Cyclopentamethylenephenylarsine* (*c*), obtained in 24 g. yield from the Mg compd. from 100 (75) g. (*a*) in 500 g. Et_2O slowly treated with 75 g. $PhAsCl_2$ in 3 vols. Et_2O, heated 0.5 hr. on the H_2O bath, decompd. with H_2O, acidified with HCl, washed with dil. KOH, dried with $CaCl_2$ and fractionated *in vacuo* in CO_2, b_{18-20} 153–4°, has a faint unpleasant odor, does not markedly oxidize in the air at room temp., mol. wt. in C_6H_6 215, 211, d_4^{20} 1.2480, $n_D^{21.4}$ 1.5944, $n_F - n_C^{22.4}$ 0.02167. It can also be obtained in 15 g. yield from 100 g. (*a*) or 61 g. $CH_2(CH_2CH_2Cl)_2$, 95 g. $PhAsCl_2$ and 750 cc. Et_2O standing over 50 g. Na wire and treated with 10 cc. AcOEt, boiled 2 hrs., the Et_2O decanted, the residue extd. with 100 cc. Et_2O, the combined solns. washed with 5% KOH and H_2O, dried with $CaCl_2$ and fractionated. *Chloride*, $C_{11}H_{16}AsCl_3$, prisms from concd., leaflets from dil. CCl_4 soln., becomes sticky in a few sec. in the air, sol. in H_2O and alc. without decompn., m. 138–9°; heated in dry CO_2 to 150° and distd. under 20 mm., it gives a fraction b. up to 200° which, treated with I in Et_2O and shaken with dil. KOH, yields $CH_2(CH_2CH_2Cl)_2$, and a fraction b. 200–16°, consisting of a mixt. of a halogen-free and a halogen-containing As compd. *Bromide*, oil. *Diiodide*, pale yellow crystals. *Tetraiodide*, brown oil. *Mercuric chloride compound*, from 6.5 g. solid $Hg(OAc)_2$ stirred into 4.4 g. (*c*), the resulting brittle mass dissolved in 35 cc. MeOH (which on evapn. deposits the *acetate* in quite unstable needles), and treated with a slight excess of 10% $CaCl_2$ in MeOH, long hair-like needles from $CHCl_3$, m. 201.5–2.0°, also obtained from the components in dil. alc. *Methiodide*, from (*c*) heated several hrs. on the H_2O bath with excess of MeI, leaflets from alc.-ligroin, m. 179.5°. *Ethiodide*, prisms, m. 185°. *Propiodide*, m. 137–8°. *sec-Propiodide*. *Butiodide*, m. 140°; the isomeric butyl iodides do not react. *Cyclopentamethylene-p-tolylarsine*, in 22 g. yield from the Mg compd. from 100 (75) g. (*a*) and 70 g. $MeC_6H_4AsCl_2$, b_{20} 162–3°, b_{50} 177–8°, does not markedly oxidize in the air at room temp., mol. wt. in C_6H_6 240, d_4^{20} 1.2174, n_D^{20} 1.5948. $n_F - n_C^{20}$ 0.02068, can also be obtained with Na instead of Mg. *Chloride*, needles from CCl_4, m. 134°, converted into the hydroxide by alc. *Mercuric chloride compound*, long hair-like needles on slow, shimmering rodlets on rapid crystn. from $CHCl_3$, m. 175°. *Cyclopentamethylenephenylstibine*, in 37 g. yield from the Mg compd. from 100 (75) g. (*a*) and 75 g. $PhSbCl_2$ and subsequent direct distn. of the product or

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preliminary decompn. with H_2O (but not acidification and shaking with KOH), $b_{18\ 20}$ 169–71°, mol. wt. in C_6H_6 276, d_4^{20} 1.4966, $n_D^{22.4}$ 1.6203; $n_F - n_C^{22.4}$ 0.02412, does not add EtI after 3 hrs. on the H_2O bath, does not combine with but is decompd. by $HgCl_2$, oxidizes in the air at room temp. in a few hrs. to the *oxide*, powder pptd. from alc. by petr. ether, does not m. 280°. *Chloride*, shimmering crystals from alc.-fuming HCl (10:1), m. 141–2°. *Ethylcyclopentamethylenebismuth*, rather thick oil, heavier than H_2O, of a very unpleasant persistent odor, rendered turbid by traces of O, oxidizes energetically in the air, but ignites only when finely subdivided; a paper moistened with it ignites in a few sec. with formation of a thick yellowish smoke. It is obtained by adding to 100 g. anhydrous $BiBr_3$ in Et_2O an Et_2O soln. of EtMgBr as long as a ppt. is formed, forcing out the Et_2O with H, washing the residue twice with 100 cc. Et_2O in a H atm., adding to the ppt. an Et_2O soln. of the Mg compd. from 70 g. (*a*), dissolving by gentle boiling, letting stand 1 hr., boiling briskly for 0.5 hr., decompg. with H_2O, forcing the Et_2O soln. with H into a flask with $CaCl_2$, drying 12 hrs. and fractionating in CO_2; it $b_{18\ 20}$ 108–12°. CHAS. A. ROUILLER.

Catalytic reduction of aldehydes and ketones. Answer to W. Ipat'ev. A. SKITA. Univ. Freiburg i/Br. *Ber.* **48**, 1486–98(1915); cf. I., *C. A.* **7**, 1170.—Repeating the expt. on which I. casts doubt, S. found that 19.4 g. freshly distd. EtCH:CMeCHO (*a*), b. 135–40°, 50 cc. alc., 20 cc. H_2O, 20 cc. of 1% $PdCl_2$ and 20 cc. of 2% gum arabic shaken with H under an excess pressure of 1 atm. absorb 1 mol. H in 3 hrs. (when the absorption stops, even if the pressure is raised to 3 atm.); an oil seps. which, after removal of the alc., yields 13 g. PrCHMeCHO (*b*), while the fraction b. above 130° gives, after removal of the (*b*) still present with $NaHSO_3$, 3.3 g. of EtCH:CMeCH$_2$OH (*c*) (in the introduction it is stated that the relative yields of (*b*) and (*c*) are as 9 to 1.—ABSTR.) When 4.3 g. (*a*), 30 cc. AcOH, 10 cc. H_2O and 20 cc. colloidal Pt soln. containing 0.062 g. Pt (*C. A.* **7**, 2557) is shaken with H under 1 atm. excess pressure, 1 mol. H is absorbed in 20 min.; as the absorption then became much slower the pressure was increased to 3 atm. and the 2nd mol. of H was absorbed in 4 hrs. more, after which no more H was used up. The product is PrCHMeCH$_2$OH, b. 146.5° (Lieben, *Monatsh.* **4**, 16(1883)); it is also formed by the reduction of 10 g. (*b*) in 40 cc. AcOH, 5 cc. of 5% H_2PtCl_6, 20 cc. of 2% gum arabic and 10 cc. colloidal Pt soln. (= 0.0939 g. Pt) with H under 3 atm. in 6 hrs. This is the alc. b. 145–6° obtained by I. from (*a*) and to which, assuming the erroneous structure EtCMe:CHCHO for (*a*), he assigned the structure EtCHMeCH$_2$CH$_2$OH. The fact that the α,β-unsatd. aldehyde (*a*) absorbs 1 mol. H to form a mixt. of satd. aldehyde and unsatd. alc. while α,β-unsatd. ketones give exclusively the satd. ketones is explained by S. on the assumption that all the different unsatd. groups in a compd. are simultaneously reduced but with varying velocities; in the ketones, the C:C bond is reduced immeasurably more rapidly than the C:O bond while in the aldehydes the difference is not so great. It is more difficult to explain why the aldehydes absorb only exactly 1 mol. H and the unsatd. alc. formed is not further reduced to the satd. alc. That this is not due to the easy reducibility of the C:C bond being destroyed by the disappearance of the adjacent acidic CHO group is shown by the fact that CH_2:CHCH$_2$OH is reduced to PrOH and PhCH:CHCH$_2$OH to PhCH$_2$CH$_2$CH$_2$OH just as rapidly as CH_2:CHCHO to EtCHO. Since with Pt in small concn. many unsatd. aldehydes add only 1 mol. H while with the same amt. of Pt but in greater concn. they add 2 mols. H the most plausible explanation is that the transference of the H is effected, not through the sepd. Pt, but through double compds. in the Fokin (*C. A.* **6**, 85) and Wieland sense; 5 g. PhCH:CHCHO in 100 cc. AcOH with colloidal Pt gives PhCH$_2$CH$_2$CHO quant. while in 50 cc. AcOH with the same amt. of Pt PhCH$_2$CH$_2$CH$_2$OH is formed. BzH (5 g.) in 35 cc. alc., 25 cc. colloidal Pt soln. (= 0.08 g. Pt) and 10 cc. H_2O with H under 1 atm. excess pressure absorbs

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1 mol. H in 5 hrs. with formation of $PhCH_2OH$; 10 g. BzH, 90 cc. AcOH, 10 cc. of 5% H_2PtCl_6, 25 cc. of 2% gum arabic and 10 cc. colloidal Pt soln. (total Pt content of soln. = 0.24 g.) absorbs 1 mol. H under 1 atm. excess pressure in 1 hr. and the 2nd mol. in 10 hrs., with formation of 8 g. of PhMe; 5 g. BzH, 50 cc. AcOH, 10 g. of 5% H_2PtCl_6, 15 cc. of gum arabic and 8 cc. colloidal Pt under 3 atm. excess pressure absorb 5 mols. H in 10 hrs. and give hexahydrotoluene. From 6.8 g. $PhCH_2CHO$ in 25 cc. AcOH, 10 cc. of 5% H_2PtCl_6, 10 cc. colloidal Pt and 20 cc. of gum arabic is obtained in 4 hrs. (1 mol. H absorbed) $PhCH_2CH_2OH$ and a little PhEt; 5 g. mesityl oxide, 20 cc. H_2O, 10 cc. colloidal Pt (= 0.031 g. Pt) absorb 1 mol. H under 1 atm. excess pressure in 40 min., giving Me_2CHCH_2Ac, while 5 g. of the mesityl oxide, 40 cc. AcOH, 10 cc. of 5% H_2PtCl_6, 25 cc. of gum arabic and 10 cc. colloidal Pt (total Pt = 0.24 g.) absorb 2 mols. H in 1.5 hrs., giving 3.5 g. $Me_2CHCH_2CHMeOH$; 10 g. α- or β-ionone, 50 cc. AcOH, 10 cc. of H_2PtCl_6, 20 cc. of gum arabic and 10 cc. colloidal Pt, absorb 2 mols. H in 40 min. and a 3rd mol. in 3 hrs. more, giving *hexahydroionone* (*1,1,3-trimethyl-2-[γ-hydroxybutyl]hexahydrobenzene*), b_{20} 142–3°, d_{20} 0.9126; *acetate*, b_{11} 131°. Pulegone (5 g.) in 40 cc. AcOH, 10 cc. of H_2PtCl_6, 15 cc. colloidal Pt and 20 cc. of gum arabic under 1 atm. excess pressure absorbs 1 mol. H in 10 min. and another in 20 min. more, giving a slightly *d*-rotatory menthol; in aq. alc. the reduction requires 1 hr. Acetone (5 g.) in 40 cc. AcOH, 25 cc. of gum arabic, 10 cc. of H_2PtCl_6 and 10 cc. colloidal Pt under 3 atm. excess pressure absorbs 1 mol. H in 30 hrs., giving 6 g. of iso-PrOH. Under the same conditions, PrAc yields in 2 hrs. 3.7 g. PrCHMeOH, Et_2CO in 2 hrs. 4 g. of Et_2CHOH, cyclohexanone in 40 min. 4.5 g. cyclohexanol, together with a little cyclohexane. In aq. alc., the reduction of acetone and cyclohexanol requires 40 and 1 hr., resp. Under the same conditions as above, 5 g. CH_2Ac_2 absorbs 3 mols. H in 4 hrs., giving PrCHMeOH. BzPh (10 g.) in 200 cc. AcOH, 20 cc. of H_2PtCl_6 (= 1 g. Pt), 15 cc. of colloidal Pt, 45 cc. of gum arabic and 50 cc. H_2O at 60° absorbs 8 mols. H in 1.5 hrs., giving *dodecahydrodiphenylmethane*, b_{750} 248–50°. CHAS. A. ROUILLER.

Residual affinities in benzopyrones. H. SIMONIS AND A. ELIAS. Berlin. *Ber.* **48**, 1493–516(1915).—$C_6H_4.CO.CMe:CMe.O$ (*a*) forms addition products not only with the halogen acids but also with other acids, a whole series of neutral metallic salts and even with bases like $PhNH_2$. In neutral solvents with the metallic salts the components combine in equimol. proportions while the compds. sepg. from strongly acid solns. generally contain 2 mols. (*a*) to 1 mol. of the metallic salt (BiI_3 is an exception). When a concd. soln. of (*a*) in fuming HCl is scratched with a glass rod or when (*a*) is rubbed with 25% HCl and fuming HCl is added to transient soln. the whole solidifies to a cryst. magma dissolving on gentle warming but recrystg. on cooling; drained on a Pt cone, washed with ice-cold HCl and spread on smooth clay it forms white needles, m. 88°, having the comp. of *bisdimethylchromone hydrochloride*, 2(*a*).HCl.$2H_2O$, decompd. so completely into its components by H_2O that the HCl can at once be titrated with 0.1 *N* alkali; the same decompn. is effected in the air or, more quickly (24 hrs.) in a desiccator; the compd. is stable only under concd. HCl. If, on the other hand, dry HCl is passed into (*a*) in cold Et_2O *dimethylchromone hydrochloride*, (*a*).HCl, seps. in needles, much more unstable even than the preceding compds. on drying and towards H_2O. *Hydrobromide*, (*a*).HBr, from a satd. soln. of (*a*) in HBr (satd. at 0°), needles, m. 85–95°, decomps. in the air and in H_2O, somewhat more stable in HBr. *Hydroiodide*, from HI (d. 1.96) satd. with (*a*) with gentle warming and then strongly cooled, yellow needles, fumes in the air when dry, decolorized by H_2O with formation of (*a*); when dry the decompn. is slower; after 24 hrs. the compd. becomes brown-red and minute crystals of I appear. *Mercuric chloride*, (*a*).$HgCl_2$, from equimol. amts. of the components in abs. alc. after several days, prisms, m. 188°; becomes opaque but

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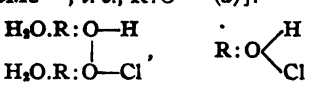
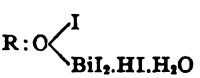
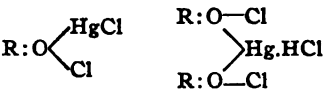
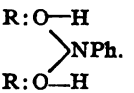
does not lose wt. at 80–90°, also obtained immediately from the components in abs. Et_2O but in smaller crystals; it is easily decompd., the addition of $PhNH_2$ to the Et_2O soln. at once giving white needles of the $HgCl_2$ compd. of the latter; H_2O likewise decomps. the compd. *Bisdimethylchromone-mercuric chloride hydrochloride*, 2(*a*).$HgCl_2$.HCl, from 2 mols. (*a*) and 1 mol. $HgCl_2$ in cold fuming HCl rubbed with a glass rod, redissolved by gentle warming and allowed to stand overnight, prisms, softens 140°, m. 153–5°, decomps. when dried at 80°, but is quite stable when dry, quant. loses its HCl in H_2O but in the cold the $HgCl_2$ is completely split off only when a few drops of dil. KOH are added. *Hydrobromide*, 2(*a*).$HgCl_2$.HBr, from the dibromide of (*a*) and $HgCl_2$ in Et_2O, needles, softens 140°, m. 155°, loses its HBr quant. in H_2O. *Chloroaurate*, 2(*a*).$AuCl_3$.HCl.H_2O, from equal wts. of (*a*) and $AuCl_3$ in fuming HCl, lemon-yellow needles, turns brown 150°, m. 161°, gives a violet-black color in alc. with traces of alkali while the aq. soln. remains clear; H_2O decomps. it in the cold, completely on heating; above 100° it blackens and gives off HCl. *Chloroplatinate*, 2(*a*).$PtCl_4$.2HCl.$2H_2O$, in 2.4 g. yield from 2 g. (*a*) and 1 g. $PtCl_4$ in fuming HCl, golden yellow spears, decomps. 192°, quant. loses its HCl in 4 hrs. at 110°, decompd. by H_2O. *Uranyl chloride*, 2(*a*).UO_2Cl_2, from the components in HCl, bright yellow prisms, does not m., darkens on a Pt foil and, without further heating, glows and smokes, leaving black-green U oxide. *Chloroferrate*, 2(*a*).$FeCl_3$.HCl, long, yellow needles, m. 116°, sometimes with yellowish prisms, softening at a somewhat lower temp., from fuming HCl; the prisms contain about 11% Fe and seem to have the comp. 2(*a*).$FeCl_3$. The needles darken in the light and are decompd. by H_2O. *Cadmium iodide hydriodide*, 2(*a*).CdI_2.2HI.$2H_2O$, in 90% yield from equal wts. of (*a*) and HI (d. 1.96), microscopic, almost colorless, pointed prisms, m. 103°, liberates HI in H_2O, loses HI and H_2O above 80°, sol. in slightly warm HI, acetone and much Et_2O, with intense yellow color, in alc. and much $CHCl_3$ without color, liberates 2 HI completely in H_2O. *Dimethylchromone-bismuth triiodide hydriodide*, (*a*).BiI_3.HI.H_2O, from 0.7 g. (*a*) and 1.18 g. BiI_3 in HI (d. 1.96), crimson needles, m. 220–30°; the red solns. in org. solvents are decolorized by H_2O or a drop of NH_3. *Dimethylchromone-aniline*, 2(*a*).$PhNH_2$, from the components allowed to stand overnight in Et_2O, prisms, m. 117°, decompd. by H_2O even in the cold. The following structures are assigned to the above compds. [R = —C_6H_4.CO.CMe:CMe —, *i. e.*, R:O = (*a*)]:









CHAS. A. ROUILLER.

Allylpropylcyanoacetic acid. EMIL FISCHER AND WALTER BRIEGER. Univ. Berlin. *Ber.* **48**, 1517–30(1915); see *C. A.* **9**, 2521. CHAS. A. ROUILLER.

Electrical effects accompanying the decomposition of organic compounds (POTTER) 2.

HERZ, A.: **Ueber komplexe Eisenverbindungen der Benzoesäure und der Salicylsäure.** Tübingen: 92 ss.

MOORE, F. J.: **Experiments in Organic Chemistry.** New York: John Wiley & Sons. $0.50.

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II. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

FRANK P. UNDERHILL.

Influence of killed yeast on digestive enzymes. M. WINCKEL. *Münch. med. Wochschr.* 62, 1007–8(1915).—Killed yeast aids the action of diastase and pancreatin. This accelerating influence is entirely independent of the power of yeast to split sugars. S. AMBERG.

The content of gluconic acid in the organism. CESARE PADERI. Univ. Pisa. *Arch. farm. sper.* 20, 82–107(1915).—Gluconic acid is not decompd. *in vitro* by the blood nor by an ext. of pancreas. In contact with an infusion of liver it is partially decompd. Oxidation products, such as saccharic, oxalic and glycollic acids, could not be demonstrated; however, a reduction product, glucose, was occasionally found. Administered to rabbits and dogs by way of the stomach or subcutaneously, gluconic acid produces more or less local irritation depending upon the concn. In fasting rabbits it causes an increase in hepatic glycogen. Gluconic acid is not normally found in the organism, even after a diet rich in carbohydrates. A. W. DOX.

Weber's law and antagonistic salt action. J. LOEB. *Proc. Nat. Acad. Sci.* 1, 439–44(1915); cf. *C. A.* 8, 3696; 9, 810.—Previously L. has shown that the normal functions of an organism are possible only when the value C_{Na+K}/C_{Mg+Ca}, the ratio of the concns. of antagonistic ions or salts, remains within certain limits, *A* and *B*. In these expts., using the newly hatched larvae of a barnacle (*Balanus iberneus*), L. found that the values *A* and *B* remain approx. const. if C_{Na+K} changes. H. D.

Results of the investigation of the constituents of urine during the year 1914. A. STRICKRODT. *Ber. pharm. Ges.* 25, 108–25(1915).—A discussion of the methods and results obtained therewith during the period in question. W. O. E.

Catalytic action of alkaloids on physical and chemical processes. (Coagulation, oxidation, saponification.) I. TRAUBE AND N. ONODERA. Charlottenburg. *Intern. Z. physik. Chem. Biol.* 1, 148–57(1914).—Pptn. of the hydrosol of As_2S_3 by alkaloids and substituted NH_3 salts is reported; it seems to depend on the soln. pressure and the elec. potential. Alkaloids (veratrine, quinine, morphine) increase the reaction velocity of the oxidation of $H_2C_2O_4$ with $KMnO_4$. In the saponification of EtOAc pilocarpine and atropine show antagonistic influences, the latter having a depressing action. Relations to reactions of alkaloids in organisms are given. E. M. FRANKEL.

Spectrographic study of amino acids and polypeptides. PHILIP ADOLPH KOBER. *J. Biol. Chem.* 22, 433–41(1915).—The absorption in the ultraviolet by aliphatic amino acids, in neutral, acid or alk. soln., is general, not specific. The aromatic amino acids show absorption bands. Di- and tripeptides show no special absorption. The lack of specific absorption by peptides in alk. soln. does not harmonize with the explanation of Dakin and Dudley for the racemization of proteins. This explanation is also attacked upon other grounds. Cf. *C. A.* 7, 489, 3602. I. GREENWALD.

Studies on the physiological action of some protein derivatives. I. Are proteoses from zein and gliadin physiologically active? FRANK P. UNDERHILL AND BYRON M. HENDRIX. Yale Univ. *J. Biol. Chem.* 22, 443–52(1915).—The intravenous injection of zeoses in relatively large doses (0.5 g. per kg.) into dogs was followed by a fall in arterial pressure and it inhibited the coagulation of the blood. Gliadoses have a very strong inhibiting action on the coagulation of the blood and a somewhat less marked action on the arterial pressure. It is evident that the presence of tryptophan in proteoses is not necessary to their physiological action. The failure of Knaffl-Lenz to

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obtain characteristic effects with his preps. was probably due to the small doses employed (cf. *C. A.* 8, 1827). **II. The relation of racemization to the physiological action of proteins and proteoses.** *Ibid* 453–64; cf. *C. A.* 7, 489, 3602.—Crude racemized proteins (casein, egg-albumen and zein) produce toxic symptoms when introduced into the circulation of dogs. (Racemized zein is not always toxic.) If these proteins are purified by soln. in alk. and repptn. with acid, they lose their toxic properties and a toxic substance is found in the filtrate. A portion, but not all, of this toxic substance may also be removed by extn. with EtOH. Proteoses prepd. by acid hydrolysis of the racemized proteins are toxic. Of the proteoses formed in the racemization of the proteins, the caseoses and albumoses are quite toxic; the zeoses are not. **III. The physiological action of Vaughan's "crude soluble poison."** *Ibid* 465–70; cf. *C. A.* 1, 1724, 2262; 4, 50, 478. Vaughan's "crude sol. poison" is much more toxic than Witte peptone. It has a very marked effect on the blood-pressure and coagulation (contrary to Edmunds, *C. A.* 7, 1914). In this respect it resembles the proteoses. It differs from these in that it is much more toxic to rabbits than are proteoses. Boiling with dil. HCl to the abiuret stage destroys its toxicity. I. GREENWALD.

Studies on reductase. IV. The influence of alkaloidal and other narcotic poisons on reductase. DAVID F. HARRIS AND HENRY JERMAIN M. CREIGHTON. *J. Biol. Chem.* 22, 535–45(1915); cf. *C. A.* 7, 798; 9, 809, 1489.—The influence of a number of alkaloids and of EtOH, Et_2O and $CHCl_3$ upon the reductase of cat liver and cerebral cortex was studied. The alkaloids had comparatively little effect on the activity of the reductase, the retardation being practically negligible with such poisons as hyoscine and aconitine. $CHCl_3$ inhibits reductase more than Et_2O or EtOH. I. GREENWALD.

Formation of humic substances from organic compounds. WILLIAM BERCROFT BOTTOMLEY. King's College, London. *Biochem. J.* 9, 260–8(1915).—Sugars boiled with HCl yield a mixt. of humic acid and humin substances, the quantities and proportions of the products varying with the sugar used. Organic acids or even heat alone can cause this hydrolysis, but the yield of humic acid and humin substances is less than when HCl is used. Protein, free from carbohydrate, does not yield humin substances. B. HOROWITZ.

Collodion membranes for ultrafiltration and pressure dialysis. GEORGE STANLEY WALPOLE. London. *Biochem. J.* 9, 284–97(1915).—The membranes are made by pouring alc.-ether solns. of collodion on leveled plate glass, and then plunging the film into water. Standard membranes are described by stating the kind of nitro cotton used, its wt. per sq. cm. of membrane, and the "wetness" (ratio of the wt. of a piece of film to its wt. when dried). Films, made in the manner described, containing 8 mg. per sq. cm. of the particular nitro cotton used and weighing, with contained water, 40 mg. per sq. cm., have been found to retain quant. all antigens with which expts. have been made. Arrangements are described of apparatus to be used for ultrafiltration and pressure dialysis. B. H.

Measurement of antagonism. W. J. V. OSTERHOUT. *Botan. Gaz.* 58, 272–6 (1914).—Measurement of antagonism in solns. containing more than 2 components presents no difficulty when equally toxic pure solns. are mixed. Methods for the graphic expression of antagonism in mixts. of 3 or more components are given. B. H.

Salvarsan a real dye. J. SCHUMACHER. *Dermatol. Wochschr.* 59, 1295–1304 (1914).—Salvarsan contains a chromophore (—As=As—) and an auxochrome group. Salvarsan is an As dye, not a dye containing As, since (like the chromophore group), the As takes part in building up the substance. An explanation of the behavior of salvarsan in tuberculosis and malaria is offered. B. H.

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The demonstration of pepsin and trypsin in the fasting stomach. G. DORNER. Berlin. *Deut. Arch. klin. Med.* 117, 540–50(1915).—In 154 patients, most of whom had gastrointestinal disturbances, gastric juice obtained by means of the stomach tube from the empty stomach, showed the presence of both pepsin and trypsin in most cases. Pepsin was demonstrated by the action of the juice on edestin in an acid medium, while trypsin was tested for with casein in an alk. medium. This procedure is useful in testing the function of the pancreas for diagnosis and is just as good as the method in which oil or cream test meals are given. Pancreatic juice is probably secreted in man as saliva and bile are. Trypsin cannot be found in the stomach that is strongly acid. In this case the duodenal contents must be obtained with the duodenal pump. Pepsin is not usually found in an alk. stomach. If pepsin is not found in the stomach after a test meal, it can often be demonstrated in the urine, showing the independence of the internal and external secretions. JULIAN H. LEWIS.

Investigations into the nature of proteins. T. ORYNG. Wien. *Kolloid Z.* 17, 14–26(1915).—A review of the work done in W. Pauli's institute from 1911 to 1915. H. I. MATTILL.

Synthesis of albumin from the nitrogen of ammonia by means of yeast. ANON. *Chem. Zig.* 39, 325, 601–4, 621–2(1915).—A general consideration of the process and its application on a commercial scale, the conclusion being that, from the present knowledge of the process, only plants of at least 4000 t. capacity per yr. could undertake the manuf. with any prospect of success, and that under normal conditions it is doubtful if it would be profitable. J. H. MOORE.

Colloids in physiology. J. G. SLEESWIJK. *Chem. Weekblad* 11, 571–3(1914).—A general lecture delivered before the Delft Natuurwetenschappelijk Gezelschap. GEORGE W. MOREY.

Living protoplasm as an ultrafilter. A. J. KLUYVER. *Chem. Weekblad* 11, 574–6 (1914).—A general lecture delivered before the Delft Natuurwetenschappelijk Gezelschap. GEORGE W. MOREY.

The physiological importance of phase boundaries. W. M. BAYLISS. *Chem. News* 112, 139–42(1915).—An address. An attempt to interpret vital phenomena as manifestations of interchange of energy between the phases of the heterogeneous systems which constitute living cells. The phenomena of adsorption in enzyme action, of permeability of cell membranes and of muscle contractility are discussed from this standpoint. W. A. PERLZWEIG.

Application of the Van Slyke micro-method for amino-nitrogen determination to the study of protective enzymes. H. STRAUSS. *Fermentforschung* 1, 55–7(1914). —Sera of various origins were incubated for 16 hrs. with solns. of placenta peptone. The amino-N in the filtrates was detd. by Van Slyke's micro-method. A large increase in the amt. of amino-N was observed in all cases where the dialysates gave a positive ninhydrin reaction. W. A. PERLZWEIG.

Digestion experiments on the action of proteolytic and peptolytic enzymes on catalase solutions. K. WINKLER. *Fermentforschung* 1, 105–30(1914).—W. continued the investigations of Waentig and Steche (cf. *C. A.* 7, 1727). These authors claim that catalase is of protein nature, basing their claim on the ground of its susceptibility to the digestive action of trypsin. W. used unpurified catalase exts. from various organs, also purified catalase from the blood. Two species of snails (*Helix pomatia* and *Arion empiricorum*) yielded active catalase prepns. which were purified. Commercial trypsin, gastric and intestinal juices and liver exts. of invertebrates were used for proteolysis and peptolysis. The activity of the various duodenal exts. on catalase differed, depending upon the origin of the ext. and of the catalase. The fibrin method was

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employed in the controls, and the action of the exts. on catalase was not parallel to that on the fibrin. A large number of duodenal exts. whose digestive activity depended only on their erepsin contents digested catalase. Since erepsin is capable of attacking protein substances only after they have been previously acted upon by pepsin or trypsin, W. claims that catalase cannot be regarded as a genuine protein, and that it does not belong to the group of substances attacked by trypsin alone. W. A. PERLZWEIG.

The application of the automatic balance to the study of enzyme reactions accompanied by absorption and loss of gases. E. ABDERHALDEN. *Fermentforschung* 1, 155–64(1914).—The balance previously described (cf. *C. A.* 8, 2404) in connection with metabolism expts. was successfully applied to studies of the activity of zymase in various forms, *viz.*: fresh yeast cells, dried yeast, yeast press-juice, etc.; also to the study of butyric acid fermentation and to urease activity under various conditions. The results of these studies will be discussed when more data are accumulated. W. A. PERLZWEIG.

The chemical nature of catalase. P. WAENTIG AND W. GIERISCH. *Fermentforschung* 1, 165–96(1914).—Catalase was obtained from beef livers by pptn. with alc. from the aq. ext., and purified by means of fractional extn. by prolonged standing with preservatives, by repeated pptn. with alc., by dialysis, and by adsorption to finely divided substances. The catalase thus obtained had the properties of a coagulable protein. It was pptd. in the cold by mineral acids, especially by HNO_3, and not pptd. by AcOH. The coagulum produced by heat was of mucin-like consistency. Alc. and $(NH_4)_2SO_4$ yielded reversible gels, which were denatured very slowly. The colloidal reagents and Br-water in AcOH soln. ppt. the substance. It responds positively to the usual protein tests, the biuret test giving a blue-violet. The dried product contained at least 14% N. The mineral content varied and could be greatly reduced. The ash contained P and Fe. That these two elements form integral parts of the molecular constitution of catalase is doubted. The substance is not believed to be a nucleoprotein. A strong Molisch reaction given by some of the prepns. points to the presence of a sugar group. W. A. PERLZWEIG.

Surface tension and ferment action. E. F. ARMSTRONG AND H. E. ARMSTRONG. *Nature* 95, 425 (1915).—The authors are of the opinion that the phenomena observed by Beard and Cramer (*C. A.* 9, 3068) in their study of the effects of surface tension on enzyme action are due entirely to the effect of alkali dissolved from the glass vessels and not to a change of surface tension as claimed. W. H. ROSS.

Surface tension and ferment action. W. CRAMER. *Nature* 95, 561–2(1915); cf. preceding abstr. Polemical. W. H. ROSS.

Surface tension and ferment action. H. T. BROWN. *Nature* 95, 616–7(1915); cf. preceding abstrs.—Certain effects observed on using diastase which were at first attributed to surface tension are now shown to be due to the inhibiting action of alkali dissolved from the glass used, to which both diastase and invertase are extremely sensitive. W. H. ROSS.

Purpurogallin yields in the oxidation of pyrogallol by means of peroxidase and hydrogen peroxide. A. BACH. *Ber.* 47, 2125–6(1914); cf. *Ber.* 37, 1342; NIERENSTEIN and SPIERS, *C. A.* 8, 128.—Solns. of 1 g. pyrogallol, 15 cc. of 1% H_2O_2 and varying amts. of peroxidase (prepd. as described in *C. A.* 8, 1488) in (*a*) 50 and (*b*) 200 cc. H_2O were allowed to stand 24 hrs. and the purpurogallin filtered, washed with 100 cc. H_2O and dried to const. wt. at 105°. In the (*a*) series, 150 cc. H_2O were added 1 hr. before the filtration. Below are given, in mg., the amts. of purpurogallin obtained in (*a*) and (*b*), resp., with 1, 2, 3, 4, 5, and 6 mg. peroxidase: 94, 98; 201, 206; 261, 258; 252, 260; 249, 262; 267, 258. In another expt. with 6 mg. peroxidase and 0.3 g. H_2O_2 the yields were 261, 264. Stöcklin (*Diss., Geneva*, 1907), with a peroxidase $^1/_{20}$ as active, claims to

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have obtained 0.5 g. purpurogallin from 1 g. pyrogallol, 0.1 g. peroxidase and 20 cc. of 1% H_2O_2. The following is a very delicate test for purpurogallin: A soln. in alc. or AcMe is dild. with 3 vols. H_2O and treated with peroxidase and H_2O_2; a violet color is formed which is gradually replaced by brown; 1 part in 500,000 can be thus detected. Phenolase gives the same reaction. The test can also be carried out in an aq. suspension of the purpurogallin, showing that the purpurogallin formed from pyrogallol escapes further oxidation only in so far as it ppts. in insol. form, so that the rapidity with which it seps. is an important factor in detg. the amt. of it obtained.

CHAS. A. ROUILLER.

Refractometric investigations of nerve fluid (cephalorachidian). III. Refractive index of the nerve fluid of both sexes. A. BABES AND A. A. BABES. *Bull. acad. Roum.* 2, 116–7(1913–4); *Chem. Zentr.* 1915, I, 1131.—Comparative investigations showed that there is no difference in the n of normal nerve fluids in man or woman. The values varied between 1.33493 and 1.33513. **IV. Recent contributions on the refractometry of nerve fluid.** *Idem* 118–21; *Chem. Zentr.* 1915, I, 1131.—Local affections caused no change in n of nerve fluid within 5 days. **V. Refractometry of the nerve fluid in infectious diseases.** *Idem* 154–6; *Chem. Zentr.* 1915, I, 1131.—Expts. made on the nerve fluids of persons with typhoid fever, grippe, pneumonia, and granulia, showed the n in maladies resembling meningitis to be always higher than normal (1.33528–1.33555); in other cases below normal (1.33482–1.33496). The detn. of n is considered valuable for the rapid diagnosis of acute meningitis. **VI. Refractometry of the nerve fluid in chronic affections of the heart and kidneys.** *Idem* 156; *Chem. Zentr.* 1915, I, 1131.—The studies included assistolia and chronic nephritis. The values obtained were with 2 exceptions normal (1.33489–1.33513).

F. W. SMITHER.

The method of union of "quellungswassers" in "quellbaren" crystals. J. R. KATZ. Amsterdam. *Z. physiol. Chem.* 95, 1–15(1915).—This problem is of importance because of its relation to the general question of swelling in physiol. chemistry. From the continuous curves obtained from the water-vapor tension and the amt. of water taken up by the crystal (CO-hemoglobin, cryst. vitellin, cryst. Bence-Jones albumose, cryst. amylodextrin of Nageli and of A. Meyer, and cryst. protagon were studied), it is shown that this water cannot be water of crystn. It is thought that they may be mixed crystals with water. The curves have the same form as those of quercitrin, Th oxalate, basic Zr oxalate, etc. It is also possible that such crystals may contain, in addition to the mixed crystals of water, water of crystn. C. J. WEST.

The method of union of the water taken up by hemin crystals. J. R. KATZ. Amsterdam. *Z. physiol. Chem.* 95, 16–7(1915); cf. preceding abstr.—Plotting the H_2O-vapor tension against the amt. of H_2O taken up by the crystals, a continuous curve is obtained. This is probably an example of mixed crystals with water, as in quercitrin and other substances. C. J. WEST.

Biochemically important organic phosphorus compounds. B. SJOLLEMA. *Chem. Weekblad* 12, 282–302(1915).—A general discussion, in which S. deals with the nuclein-free proteins contg. phosphoric acid, phosphoric esters of the carbohydrates and the satd. and unsatd. phosphatides. J. T. FLOHIL.

A stable urease preparation. B. C. P. JANSEN. *Chem. Weekblad* 12, 483(1915).—A stable urease prepn. was made by mixing an aq. ext. of soy beans with an equal vol. of glycerol. The aq. soln. is prepd. by extg. 9 parts of powdered soy beans for several hrs. with 5 parts of H_2O and sepg. the mixt. by centrifugation. J. T. FLOHIL.

Contributions to the physiology of the cell, with special reference to the velocity of oxidation in cells. OTTO WARBURG. Heidelberg. *Ergebnisse der Physiologie* 14,

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253–337(1914).—Chapters are devoted to: the velocity of oxidation and work, retardation of oxidation, oxidation velocity and O concn., the influence exerted on the velocity of oxidation by lipoid-insol. and lipoid-sol. compds., the influence exerted on the oxidation velocity by the temp. and the mechanism of oxygen respiration.

JOSEPH S. HEPBURN.

The protoplasm as a physical system. LUDWIG RHUMBLER. München. *Ergebnisse der Physiologie* 14, 474–617(1914).—A discussion based on the theory that protoplasm is a heteromorphic spumoid. JOSEPH S. HEPBURN.

John Seemann. MAX CREMER. *Ergebnisse der Physiologie* 14, 657–65(1914). —An account of Seemann's work in biochemistry and physiology, with bibliography.

JOSEPH S. HEPBURN.

A device for automatically registering polarimetric studies of optically-active substrates, or such substrates as in the course of their transformation assume optically active properties. *Fermentforschung* 1, 63–5(1915).—The arrangement consists of an attachment for the establishment of field equality with the aid of light-sensitive K cells, which photographically record changes in rotation.

B. HOROWITZ.

Bile pigments. VI. Mesobilirubin and mesobilirubinogen. H. FISCHER. *Z. Biol.* 65, 163–82(1914).—Mesobilirubinogen (hemibilirubin) is readily converted into mesobilirubin by heating with 10% soln. of K methoxide at 150°. At 170° xanthobilirubic acid is also formed. Mesobilirubin is sol. in $CHCl_3$ and insol. in hot, glacial acetic acid, whereas xanthobilirubic acid is sparingly sol. in the former and readily so in the latter. The employment of biological methods to convert mesobilirubin into mesobilirubinogen was unsuccessful, but the conversion could be readily accomplished by the use of Na amalgam. Mesobilirubinogen was isolated from pathological urine. Whenever the daily urine responded to Ehrlich's aldehyde test, it was extd. with $CHCl_3$. Forty liters (combined extracts) gave 0.02 g. mesobilirubinogen, which was identified by crystallographic measurements, m. p., and reactions. B. HOROWITZ.

Permeability of the internal cytoplasm of animal and plant cells. G. L. KITE. *Am. J. Physiol.* 37, 282–99(1915).—Various dyes were injected from capillary pipets into many animal and plant cells. Results were opposed to the theory that cells are surrounded by a plasmatic membrane of special properties. With eggs of certain marine animals the whole protoplasm offers a barrier against the penetration of dyes. With vegetable cells the internal protoplasm is freely permeable to a large variety of dyes. Cell walls and not protoplasm of plant cells prevent the entrance of dyes.

J. F. LYMAN.

Conditions of conduction and excitation in irritable cells and tissues and especially in nerve. II. R. S. LILLIE. *Am. J. Physiol.* 37, 348–70(1915).—Assuming certain properties of cell membranes toward ions L. shows how stimulation may set up elec. currents and how such currents may be transmitted in nerve or muscle cells.

J. F. LYMAN.

Rate of oxidation of enzymes and their corresponding pro-enzymes. W. E. AND E. L. BURGE. *Am. J. Physiol.* 37, 462–70(1915); cf. *C. A.* 8, 2892.—Pepsin is more easily oxidized than pepsinogen, trypsin than trypsinogen. These facts help to explain the failure of the enzymes to act on the walls of the digestive tract in which they are oxidized and the possibility of the occurrence of the intact pro-enzymes in the cells of the stomach and pancreas. J. F. LYMAN.

Osmotic properties of calcium and magnesium phosphate in relation to those of living cells. E. B. MEIGS. Wistar Inst. *Am. J. Physiol.* 38, 456–89(1915).—Semi-permeable membranes of $Ca_3(PO_4)_2$ and $Mg_3(PO_4)_2$ were prepd. and compared with

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other semipermeable membranes. M. supports Morse's hypotheses *viz.*, (1) semipermeable membranes are always colloidal and (2) the passage of H_2O through such membranes is the result of unequal hydration at the opposite surfaces of the colloid. The role of Ca and Mg phosphates in the osmotic properties of living tissues is discusssd and the conclusion reached that the semipermeable properties of Ca and Mg phosphates, so far as they have been studied, are as much like those of living tissues as the semipermeable properties of any other artificial osmotic membranes that have been examined up to this time. J. F. LYMAN.

Affinities of hematin. J. A. MENZIES. *J. Physiol.* 49, 452–6(1915).—M. was unable to confirm the work of Ham and Balean (*J. Physiol.* 32, 312(1905)) who concluded that acid hematin and egg white in soln. together unite to form oxyhemoglobin. Spectroscopic evidence indicates that hemochromogen and globin may reunite to form hemoglobin provided the hematin from which the hemochromogen is produced has not been pptd. It is suggested that (1) the spectroscopic evidence is by itself unreliable or (2) there is an alteration in the chem. composition of the hematin due to the fact of pptn. or (3) the unpptd. hematin is still in loose combination with the globin so that the rebuilding of the mol. is more easily effected. J. F. LYMAN.

On the action of temperature and humidity on the organism. F. S. LEE AND E. L. SCOTT. New York. *Proc. Soc. Exp. Biol. Med.* 12, 10–3(1914).—The influence of high temp. and high humidity on cats for a period of 6 hrs. showed that the total amount of work which certain muscles (sternal strip of diaphragm, *extensor longus digitarum* and sartorius) are capable of doing before exhaustion sets in is markedly diminished. Body temp. also rose in the atmosphere of high temp. and high humidity. V. C. MYERS.

Thermo-regeneration of diastases of yeast. G. BERTRAND AND M. ROSENBLATT. *Bull. soc. chim.* 15, 762–5(1914).—Maltase and catalase from dried yeast showed no regeneration of the enzymic powers after the enzyme extracts were heated above 70°. Yeast sucrase did show such regeneration (cf. *C. A.* 8, 3058). This difference in the action of heat upon maltase and sucrase, two enzymes ordinarily regarded as very similar in chemical nature, will be further investigated. W. A. PERLZWEIG.

Experiments on the syntheses of polypeptides, peptones and proteins by enzymes. E. ABDERHALDEN. *Fermentforschung* 1, 47–54(1914).—Numerous efforts of A. to synthesize proteins by the action of pepsin, trypsin and erepsin gave negative results. By subjecting a mixt. of amino acids obtained from a definite organ to the action of the maceration juice of the same organ for several months a decrease in the amt. of amino-N and an increase in the amt. of coagulable protein were observed. Similar results were obtained by using a mixture of peptone derived from a given organ with the juice of the same organ. The author points to these results as further illustrations of the specific action of cellular enzymes. W. A. PERLZWEIG.

The significance of viscosity measurements in the study of organic colloids. J. SCHIBIG. *Intern. Z. Biol.* 1, 260–8(1914).—The various theories of viscosity, those of Einstein, Hatschek and Hess, are discussed, and their correlation with biologically important viscosity measurements is studied. The role of blood corpuscles in the viscosity of the blood is considered. A number of other colloidal phenomena are discussed, including the relationship between viscosity and swelling. W. A. PERLZWEIG.

The influence of friction and of surface tension in biological processes. I. TRAUBE. *Intern. Z. Biol.* 1, 275–91(1914).—T. points out that in his theory of the mechanism of the action of surface-active substances upon cells it has not been considered that it is only in rare cases that one works with equiv. wts. It is suggested that in such processes as hemolysis, retardation of oxidation and fermentation, narcosis, and streaming

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of protoplasm in plants, viscosity plays a very important role, through its influence on the rate of diffusion. With this consideration in view, exceptions which apparently do not support the law of isocapillarity can be fully explained. W. A. PERLZWEIG.

Colloidal solutions in chloroform. H. FREUNDLICH AND JOHN A. GANN. *Intern. Z. Biol.* **2**, 1–18(1915).—Solns. of pure fats in $CHCl_3$ do not stain with methylene blue more deeply than does $CHCl_3$ alone; pure spermacetti behaves similarly. The impure fats are stained considerably more under the same conditions. Spermacetti or fat dissolved with a small quantity of acid in $CHCl_3$, when shaken with an aq. soln. of NaOH, yields a milky emulsion which contains the material in the dispersed phase. The dispersed phase consists in all probability of an aq. soap soln., the particles of which are surrounded by soap-contg. membranes. The distribution of methylene blue between the H_2O and the milky $CHCl_3$ fat emulsion is indicative of adsorption, since the equivalent wt. and adsorption isothermal relationships are found to apply well in these cases. Also the union of a $CHCl_3$ soln. of acid contg. tristearin resembles closely an adsorption phenomenon. Czapek's contention (*C. A.* **9**, 2102), that lipoids are present in a colloidal state in the plasma membranes is discussed, and the difficulty of demonstrating their presence by the use of dyes is pointed out. W. A. PERLZWEIG.

The velocity of formation and solution and of swelling of gels. I. TRAUBE AND F. KÖHLER. *Intern. Z. Biol.* **2**, 42–84(1915).—Indifferent narcotics when added to gelatin soln. retard the "jellification" proportionally to the narcotic action of the substance. Peptone and nonelectrolytes which increase the surface tension of H_2O (sugars, glycerol) accelerate gel-formation. The velocity of soln. and velocity of gel-formation were found to be related in a *strictly inverse ratio*, under the action not only of narcotics, but of all substances exercizing a definite effect on the velocity of the processes. Acids in very small concns. (<0.01 *M* per l.) accelerate gel-formation; above this concn. there is a retardation, reaching the max. with 0.019 *M* per l. The effect on velocity of soln. is the reverse of that on velocity of gel-formation. Bases retard gel-formation and accelerate soln. The cations and anions in added salt solns. act, in respect to the magnitude of the effect on gel formation, in definite series: $Na^+ — K^+ — Ca^{++}$; $I^- — Br^- — CN^- — NO_3^- — Cl^- — SO_4^=$. The effect on velocity of soln. is the reverse of this. Gel-formation in dil. gelatin solns. is greatly accelerated by alkaloidal salts (except salts of atropine), while soln. is retarded. Conc. gelatin solns. are affected reversely by alkaloids. Atropine acts as an antagonist to muscarine and pilocarpine. The antagonistic action of many other substances is discussed. The results of earlier investigations on the magnitude of swelling of colloids (Hofmeister, Pauli, Ostwald, *et al.*) are correlated with the measurements of velocity of soln. of colloids; to the greater velocity of soln. of a colloid corresponds a greater capacity to swell. The relation of these exptl. results to the following biological problems is indicated: narcosis, plasmolysis of cells, chemotaxis, muscular work, edema and inflammations. W. A. PERLZWEIG.

Yeast protein (NEUBERG) **16.**

AMOSS, H. L.: **Chemistry and Chemical Uranalysis.** New York: Lea & Febiger. 270 pp. $1.50.

TERROINE, E. F.: **The Numerical Data of Biology.** Chicago: Univ. of Chicago Press. 17 pp. 4 fr.

B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

Urochromogen test in urine. E. PULAY. *Münch. med. Wochschr.* **62**, 1009 (1915).—The canary yellow color produced in urine diluted 3 times on addition of a a few drops of 1 per mille $KMnO_4$ soln. is referable to urochromogen, a precursor of urochrome. Its presence denotes a toxic disturbance of metabolism. The test is com-

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pared with the diazo test in a number of cases. Of interest is the fact that the diazo test was positive in all cases of pneumonia (6) examined while the $KMnO_4$ test was negative. S. AMBERG.

A simple apparatus for the quantitative estimation of small amounts of albumin. R. WEISS. *Münch. med. Wochschr.* **62**, 1010(1915).—It is claimed that with the method described an amt. of protein as small as 0.1 mg. can be demonstrated accurately. The method is based on the turbidity produced by protein in an alc. phosphotungstic acid soln. and is of clinical interest. S. AMBERG.

A method for the quantitative estimation of uric acid in blood. C. MAASE AND H. ZONDEK. *Münch. med. Wochschr.* **62**, 1110–1(1915).—Draw 6 or 7 cc. blood from a vein into a flask containing some NaF. Measure out 5 cc. of this (whole blood) and coagulate by boiling with 0.01 *N* acetic acid. Wash the filter with boiling water containing Na acetate. Acidify the filtrate with 2.5 cc. 50% acetic acid and evap. to 5 cc. Neutralize with satd. Na_2CO_3 soln. and transfer to a 25 cc. measuring flask to which is added 2.5 cc. satd. Na_2CO_3 soln. and 1 cc. phosphotungstic acid reagent. Fill the flask to the mark and let stand 10 min. Compare colorimetrically in the Autenrieth-Königsberger instrument with the standard. The blood, when used, should not be more than 24 hrs. old. Other substances giving the phosphotungstic acid reaction could only be present in concns. in which they do not react. Nevertheless, on the basis of control expts., where the uric acid was removed before the test was concluded, 0.5 mg. uric acid was deducted from the final figures. The advantages of the method are: (1) It avoids pptn. of uric acid with the loss entailed thereby. (2) It can be used with relatively little blood, and can be carried out in not more than $1^1/_2$ hr. (3) It is rarely unsuccessful and easily learned. (4) Uric acid added to blood is found with the loss of at the most a few deci-milligrams. (5) The results, particularly the averages, agree well with the figures of other authors, using much more complicated methods. The examn. of 30 healthy individuals after a 3-day purine-free diet averaged 2.5 mg. uric acid in 100 mg. total blood. Figures exceeding 3.7 mg. may be regarded as pathological. S. AMBERG.

A simple method for the determination of nitrogen in urine. V. C. MYERS. *Münch. med. Wochschr.* **62**, 1076–7(1915).—The method is a modification of the Folin-Farmer method and is accurate only to about 5%. It is considered simple enough for the general practitioner. S. AMBERG.

Regeneration of used endoagar. H. MOHORCIC. *Münch. med. Wochschr.* **62**, 1143–4(1915).—The used endoagar is sterilized in the autoclave, poured in a glass dish, cooled and divided into small pieces. The pieces are put in a large closed bottle with a cork cut so that it can escape without carrying pieces of agar along. After 24 hrs. the agar has very little color. The agar is again melted, animal charcoal added and the mixt. boiled. It is then cooled to 50° and egg white, in a little water, is added. The vessel is put in a heated steam sterilizer for 1 hr. and then allowed to cool without opening the app. The charcoal is at the bottom and can easily be cut off. The water content of the agar is detd. by drying a small amount in a Pt dish on the water bath. In this way agar media of known compn. can be made. S. AMBERG.

A sensitive clinical method for the determination of mercury in urine. M. PERLSTEIN AND J. ABELIN. *Münch. med. Wochschr.* **62**, 1181–3(1915).—To 500 cc. urine add 10 cc. concd. HCl, boil 1 min. and cool. Add 5–6 cc. NH_4OH or a few cc. NaOH (the reaction remaining weakly acid), then 20 to 25 g. NaOAc and 10 cc. 10% $FeCl_3$. Heat again to boiling, filter hot and wash the filter a with little hot water. Dissolve the moist ppt. in a porcelain dish with as little concd. HCl as possible and filter into a crystallizing dish. This final soln. makes in most instances 15–20 cc. The further pro-

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cedure is according to Salkowski; Hg is deposited on copper and finally transformed to HgI_2. It is possible to detect in this way 0.1 mg. Hg. S. AMBERG.

Serodiagnosis of syphilis with chemical substances (coagulation reaction). V. DUNGERN. *Münch. med. Wochschr.* **62**, 1212–3(1915).—A stock soln. of indigo is made by dissolving 1 g. in 4 cc. concd. H_2SO_4 and filling up to 100 cc. with water. Before using, 1.5 cc. is mixed with 10 cc. water and to 1 cc. of this mixt. 0.25 cc. Fehling 2 is added. To 0.3 cc. of the serum (heated one-half hour to 54°) to be tested add 0.2 cc. of the last mixt., let stand $^1/_2$ hr., then place in boiling water 1 min. Small, thin-walled tubes should be used to insure quick heating without evapn. After 2 hrs. standing the result is noted. Certain precautions have to be taken with the indigo, which is not always the same. Sera of syphilitics coagulate; others remain fluid. Sera from cases of bone tuberculosis may coagulate also. The sera of luetics and patients with bone tuberculosis seem to contain relatively much protein detd. refractometrically. S. AMBERG.

Report on inorganic plant constituents. W. H. MCINTIRE AND B. E. CURRY. *J. Assoc. Off. Agr. Chem.* **1**, 55–9(1915).—Excellent results are obtained by the official method for total S; since no object seems to be gained by duplication of similar methods, it is recommended that no further work be done on the Schreiber method. It is recommended that the extension of the official method for Fe and Al to include detn. of Ca and Mg in presence of Mn be adopted as provisional. W. H. FRY.

A method for the determination of plasma and blood volume. N. M. KEITH, L. G. ROWNTREE AND J. T. GERAGHTY. Johns Hopkins Hosp. *Arch. Intern. Med.* **16**, 547–76(1915).—The method depends upon the introduction directly into the circulation of a non-toxic dye which remains in the plasma long enough for thorough mixing and upon the detn. of the concn. of this dye in the plasma by comparison with a suitable standard mixt. of dye and plasma. The dye used is vital red (di[4(3,6-disodium-disulfonate-1-hydroxyazonaphthyl)-2,5-dimethylphenyl] phenylmethane). Doses of from 5 to 10 mg. per kg. may produce a slight, transient albuminuria. At least 10 mg. per kg. are necessary to stain the tissue even slightly. The routine dose is 3 mg. per kg. employed in 1.5% soln. in distd. H_2O. *Method:* A needle attached to a piece of rubber tubing is inserted into one of the veins of the arm and 10 cc. of blood are aspirated into a pipet. This is transferred to a 50 cc. centrifuge tube containing $Na_2C_2O_4$ to prevent clotting. (This is used in the prepn. of the standard.) The rubber tube is removed and the vital red injected. Three min. later, 10 cc. of blood are withdrawn from the other arm and similarly treated with $Na_2C_2O_4$. Two or 3 min. later 10 cc. more are drawn and transferred to a graduated 15 cc. centrifuge tube containing $Na_2C_2O_4$. The 3 tubes are capped and centrifugated at 3000 r. p. m. for 20 min. The proportion of plasma to cells in the graduated tube is noted. The plasma from each tube is pipetted off into clean test tubes. 0.5 cc. of the dye soln. (0.0075 mg. dye) is dild. to 100 cc. with 0.8% NaCl. This is dild. with 1 part of plasma (obtained before injection of the dye) and 2 parts NaCl soln. and used as the standard. The other specimens of plasma are dild. with 3 vols. of NaCl soln. and read against the standard. Plasma vol. in cc. = wt. of subject in kg. × 4000 ÷ reading of dild. plasma against standard (this taken as 100). From the hematocrit reading and the above value the total vol. of blood is readily calcd. Sometimes there is slight hemolysis and the colors will not match exactly but 1 of the 2 specimens will almost always give satisfactory results. Marked lipemia makes the detn. impossible but with due attention to the diet and to the time of drawing the blood, this can be avoided. The patient suffers comparitively little discomfort. Tests show that there is no appreciable loss of the dye from the blood within 6 min. and that none is absorbed by the red cells. "With this method, duplicate detns. on normal subjects yield identical values. The amt. of decrease in

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blood vol. as the result of hemorrhage and of increase following intravenous infusion of saline has been demonstrated. Changes in blood vol. are insignificant in experimentally induced hypertension and hypotension and cannot be brought into causal relationship with them." Normal individuals have approx. 50 (42–56) cc. of plasma per kg. body wt. The normal hematocrit values were approx. 43% erythrocytes and 57% plasma. Normal individuals have approx. 85 (78–97) cc. of blood per kg. body wt. In pregnancy, before term, the blood and plasma are increased. Within a week or two after delivery, the blood vols. return to normal. In obesity, the plasma and blood vols. are relatively small. Many cases of anemia exhibit a relatively large plasma vol. Polycythemia (high blood count) may be dependent on low plasma vol. or may be associated with large plasma vol. (true plethora). Hyperglucemia exists without increase in blood vol. In anasarca, accompanying myocardial insufficiency, the blood vol. may be increased. A small vol. is shown in may cases of hypertension.

I. GREENWALD.

The determination of the bile salts in urine by means of the surface tension method. GEORGE D. ALLEN. Univ. Minn. *J. Biol. Chem.* **22**, 505–24(1915).—The surface tension as measured by a Traube stalagmometer is suggested as a basis for the detn. of bile salts in urine. Other urinary constituents, particularly acetone and β-hydroxybutyric acid, lower the surface tension but if the urine be diluted until its sp. gr. is 1.010 and if the surface tension then be detd. in acid and in alk. reaction, one may by reference to a table given by A. find the max. and min. amts. of Na glycollate capable of yielding this surface tension. The method yields only an approximation but the results may be of clinical value.

I. GREENWALD.

A criticism of the Bang and Lewis-Benedict methods for the estimation of blood sugar with suggestions for a modification of the latter method. R. G. PEARCE. Western Reserve Univ. *J. Biol. Chem.* **22**, 525–33(1915).—The difficulties encountered in the detn. of blood-sugar according to Bang (*C. A.* **8**, 1292) were incomplete pptn. of the proteins, inequalities in the time required to heat the contents of different flasks to boiling under apparently identical conditions, great ease of reoxidation of the Cu_2O, etc. The method could be modified to give satisfactory results as follows: 2 cc. of blood are added to 19 cc. of H_2O, 10 cc. of dialyzed Fe and 1 cc. satd. Na_2SO_4 soln. are added and the mixt. is filtered. Two cc. of the filtrate are mixed with 10 cc. satd. KCl soln. and 1 cc. Bang's Cu soln. in a 25 cc. Jena flask, over the neck of which a rubber tube is drawn. This is placed in a bath of Russian white oil at 140° for 5 min. The rubber tube is then clamped and the flask cooled rapidly; CO_2 is then admitted to fill the vacuum and the soln. titrated with 0.01 *N* I soln. in an atmos. of CO_2. The value of the I soln. in terms of glucose is detd. by expt. as is the reduction in a blank expt. The amt. of I soln. required is proportional to the amt. of glucose. The method requires careful attention and was soon discarded in favor of the Lewis-Benedict method (*C. A.* **9**, 638). This method was found very satisfactory, but where it is desired to make a number of simultaneous detns., the following modification is recommended: Two cc. of blood are added to 8 cc. of H_2O in a test tube and 15 cc. of satd. picric acid soln. added. After filtering, 6 cc. are measured into another test tube, 2 cc. satd. picric acid and 1 cc. 10% Na_2CO_3 are added and the mixt. placed in an autoclave at 2.5 kg. per sq. cm. (or 20 lbs. per sq. in.) for from 15 to 30 min. It is then removed, cooled, dild. to 10 cc. in a flask and compared with the standard in a colorimeter. It is advizable to dil. the standard of L. and B. by 1/4 so as to allow for the difference in amts. taken without unnecessary calcn.

I. GREENWALD.

Detection and concentration of antigens by ultrafiltration, pressure dialysis, etc., with special reference to diphtheria and tetanus toxins. A. T. GLENNY AND G. S. WALPOLE. London. *Biochem. J.* **9**, 298–308(1915).—None of the antigens tried

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was found to pass through membranes of the special type described. The use of these membranes is suggested for the preliminary tests of the specificity of the toxic element of any cultural fluid. The recognition and subsequent concentration of the antigen of a fatal epidemic in squirrels was effected by this means, and an investigation of the nature of the toxicity of filtrates of malignant edema cultures was successful. By this method mallein and tuberculin were freed from glycerol and a considerable quantity of nitrogenous material. A process has been worked out for the concn. and purification of diphtheria toxin which, at a yield of 70–80%, diminishes the N content about 50 times. It is performed by dialysis under pressure, followed by acidification, centrifugation, and re-solution in a trace of alkali, of the small precipitate obtained. By ultrafiltration, followed by pressure dialysis, a concn. of tetanus toxin may be effected which should be of considerable practical value, for the disintegration products of the broth materials which accompany the antigen are particularly objectionable in this case. The membranes are impermeable to enzymes, but allow to pass secretin, the pituitary active principle, the co-enzyme of zymase, and the toxic constituent of Witte peptone.

B. H.

Contribution to Abderhalden's dialysis method. F. Pregl. *Fermentforschung* **1**, 7–12(1914).—The thimbles are prepared from a 6% collodion soln. The test tubes are covered with an even layer of the collodion (details are given), then treated with 70% alc., and, after the removal of the alc., with water. After 1/4 hr. the collodion bag can be removed. These bags can be kept for a long time in 60% alc. and show a remarkable uniformity. Peptones dialyze easily. Egg-white is not altogether indiffusible, since a slight positive biuret is obtained after 20 hrs. dialysis. Ninhydrin gives only a pure yellow with the dialysate.

B. Horowitz.

Improvements in the method for the analysis of proteins by determination of the chemical groups characteristic of the different amino acids. Donald D. Van Slyke. *J. Biol. Chem.* **22**, 281–5(1915).—Modifications of the technic described in the original article (*J. Biol. Chem.* **10**, 15–55(1911); cf. *C. A.* **5**, 1938) have been made which diminish the liability of error and increase the ease and sureness of the manipulations. The agreement between duplicate detns. when these modifications are employed is much closer than that claimed for the original method. The method is designed "for use only with proteins not accompanied by other classes of substances, particularly nitrogeneous, which would obviously falsify the interpretation of the results unless the behavior of the non-protein substances were so accurately known that corrections could be made."

A. P. Lothrop.

A colorimetric method for the determination of phenols (and phenol derivatives) in urine. Otto Folin and W. Denis. Harvard Med. School and Mass. General Hosp. *J. Biol. Chem.* **22**, 305–8(1915).—Measure 10 cc. of urine (20 cc., if very dil.) into a 50 cc. volumetric flask. Add a 3% soln. of Ag lactate in 3% lactic acid until no further ppt. is obtained and a few drops of colloidal Fe. Shake, fill to the mark, shake again and filter. By this process uric acid and traces of proteins are quant. removed. Transfer 25 cc. of the filtrate to a 50 cc. volumetric flask and ppt. the Ag by adding a satd. soln. of NaCl containing 10 cc. of concd. HCl per liter until pptn. is complete. Fill to the mark, shake and filter. To det. "free" (non-conjugated) phenols, measure 20 cc. of the filtrate into a 50 cc. flask and add 5 cc. of phosphotungstic phosphomolybdic acid reagent and 15 cc. of satd. Na_2CO_3 soln. Dil. to the mark with H_2O at 30–5°, allow to stand for 20 min. and compare the color of the deep blue soln. in a Duboscq colorimeter with that of a standard soln. of PhOH. To det. *total* (free and conjugated) phenols, measure 20 cc. of the same filtrate into a large test tube, add 10 drops of concd. HCl and cover the test tube with a small funnel. Heat rapidly to boiling over a free flame and place in a boiling H_2O bath for 10 min. Cool and transfer

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to a 100 cc. volumetric flask. Add 10 cc. of the phosphotungstic phosphomolybdic acid soln. and 25 cc. of satd. Na_2CO_3 soln., make up to the mark, shake and read after 20 min. Use as a standard a soln. of PhOH in 0.01 *N* HCl containing 1 mg. of PhOH per 10 cc. Add to 5 cc. of this soln. (equiv. to 0.5 mg. of PhOH), 5 cc. of the phosphotungstic phosphomolybdic acid reagent and 10 cc. of satd. Na_2CO_3 soln., make up to 100 cc. with H_2O at 30° and set in the colorimeter at 20 mm. Standardize a PhOH soln. by prepg. a soln. in 0.1 *N* HCl containing 1 mg. of cryst. PhOH per cc. Measure 25 cc. of the soln. into a 250 cc. flask, add 50 cc. of 0.1 *N* NaOH, heat to 65°, add 25 cc. of 0.1 *N* I soln., stopper the flask and allow to stand at room temp. for 30–40 min. Add 5 cc. of concd. HCl and titrate the excess of I with 0.1 *N* $Na_2S_2O_3$ soln. 1 cc. of 0.1 *N* I soln. corresponds to 1.567 mg. of PhOH. Dil. the PhOH soln. so that 10 cc. contains 1 mg. of PhOH. Prep. the phosphotungstic phosphomolybdic acid reagent by boiling 100 g. of Na tungstate, 20 g. of phosphomolybdic acid (or an equiv. amt. of MoO_3), 50 cc. of 85% H_3PO_4 and 75 cc. of H_2O for 2 hrs. Cool and make up to 1 liter, filtering if necessary. The method is *not* directly applicable to the detn. of phenols in blood, tissues and feces. A. P. Lothrop.

A qualitative (reduction) test for sugar in normal urine. Otto Folin. Harvard Med. School. *J. Biol. Chem.* **22**, 327–9(1915).—The test is proposed as a simple and instructive method for showing the presence of normal traces of sugar in normal urine. The reagent consists of 2 solns.: (*a*) Dissolve 5 g. of cryst. $CuSO_4$ in 100 cc. of hot H_2O, cool and add 60–70 cc. of pure glycerol; (*b*) dissolve 125 g. of anhydrous K_2CO_3 in 400 cc. of H_2O. Mix 1 part of (*a*) with 2 parts of (*b*). The reagent must be *freshly* prepd. In a test tube or small flask pour about 10 cc. of urine and add 2 g. of picric acid and 2 g. of Kahlbaum's or Merck's blood charcoal. Shake for 5 min. and filter. By allowing the urine and picric acid to stand for 30 min. the addition of the charcoal may be omitted. Add 1–2 cc. of the creatinine-free filtrate and a pebble or two (to prevent bumping) to about 10 cc. of the freshly prepd. sugar reagent in a large test tube and boil for 1–1½ min. *with constant shaking.* "If the sugar present is considerable (above the normal variations), a typical reduction is obtained. If the trace of sugar is smaller, but still rather large, the whole soln. will become turbid as in Benedict's test. If no such turbidity is produced and the boiling mixt. remains clear, transfer it at once (while still very hot) to a centrifuge tube and centrifuge for 1–2 min. Typical red Cu_2O such as is obtained with pure sugar solns. will be found in the bottom of the centrifuge tube below the green cryst. K picrate which usually forms as the liquid cools." If the Cu reagent gives a slight Cu_2O sediment when boiled alone, it should be boiled and centrifuged once before it is used for the test. In testing the urines of about 100 normal persons a positive reduction was obtained in every case. "The amt. of sugar present in normal urine is therefore probably much greater than is indicated by the negative findings recorded on the basis of the clinical qual. tests for sugar in current use." A. P. Lothrop.

A method for the estimation of the tryptophan content of proteins, involving the use of baryta as a hydrolyzing agent. Annie Homer. Lister Inst. and Univ. of Toronto. *J. Biol. Chem.* **22**, 369–89(1915).—Treat 100 g. of casein with a soln. of 350 g. of $Ba(OH)_2$ in 2.5 l. of H_2O and heat on a water bath for about 40 hrs. Remove the Ba with H_2SO_4 and filter. Make the filtrate 5% acid with H_2SO_4, add an excess of a 10% soln. of $HgSO_4$ in 5% H_2SO_4 and allow to stand for 48 hrs. Filter and free the ppt. from tyrosine by washing with 5% H_2SO_4 until the washings no longer give the Millon test. Suspend the ppt. in 2% H_2SO_4 and decomp. with H_2S. Filter, remove the H_2S by boiling and, while still acid, add a soln. of phosphotungstic acid, avoiding excess. After standing, filter off the ppt. of polypeptides if any appears. Remove the excess of phosphotungstic acid with $Ba(OH)_2$ and the latter with H_2SO_4. Cystine is destroyed

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by the alk. hydrolysis. Make up to a suitable vol. and take 50 cc. for the estn. of tryptophan. To the soln. in a glass-stoppered flask add a known excess of an aq. soln. of Br or a known amt. of nascent Br liberated by the addition of 5 cc. of concd. HCl to a previously measured vol. of equal parts of $NaBrO_3$ (15.1 g. per l.) and NaBr (51.5 g. per l.). Stopper the flask and allow to stand at about 17° for about 4 hrs. Add excess of 10% KI soln., allow to stand for 15 min. and estimate the I, representing the excess of Br, by titration with standard $Na_2S_2O_3$ soln. The aq. Br soln. should be standardized every time it is used. One mol. of tryptophan absorbs 8 atoms of Br. A considerable excess of Br must be added. The Br absorption of the hydrolyzed soln. is compared with that of a freshly prepd. soln. of pure recrystd. tryptophan treated with the brominating solns. under comparable conditions of time and temp. Analysis of 3 samples of com. casein from different firms, gave a content of tryptophan of 1.59, 1.1 and 1.24%. The final solns. do not contain more than traces of indole derivs. which also absorb Br and the results indicate that there is no appreciable formation of substances from tryptophan which do not appear in the final solns. for estn. with Br. Tryptophan is much more resistant to the action of $Ba(OH)_2$ than to the action of acids with or without the presence of O carriers. Detns. of tryptophan by this method should be of the greatest service in expts. on nutrition and in the prepn. of synthetic diets.

A. P. LOTHROP.

Chemical detection of blood. DOMENICO GANASSINI. *Boll. chim. farm.* 53, 777–81(1914); *J. Chem. Soc.* 108, II, 295.—G. has investigated Baecchi's test for blood which is executed as follows: Two cc. of an aq. alizarin-S-blue soln. diluted to a mahogany yellow color are mixed with about $^1/_2$ the vol. of 3% H_2O_2 soln. A little of the liquid to be tested is then slowly poured down the wall of the test tube. If blood is present, gentle shaking rapidly renders the liquid intensely blue, the blue color slowly fading and giving place to a red color which is moderately stable. This reaction gives a positive result with 1 pt. blood in 20,000; the reaction also gives good results with blood which has undergone alteration and has become insol. in H_2O, the blood being in this case first dissolved in alc. acidified with HCl. This test is very rapid and simple but is not sp., since it is given by sol. Fe salts, especially $FeSO_4$, and H_2CO_3 even in minimal traces, and also by KI, chrome alum, free chromic acid and ferratin. HNO_2 or HIO_3 gives the blue coloration in the absence of H_2O_2, which changes the color to red and then to yellow. Many animal and vegetable organic compds. fail to respond to Baecchi's test, which in any case is completely successful only in faintly acid liquids, H_2CO_3 being sufficiently strong for this purpose. This test can only be regarded as of value when it yields negative results.

H. S. PAINE.

Test of the activity of protective enzymes by removal of proteins by heat coagulation and by the use of the micro-method for nitrogen determination in the filtrate. M. PAQUIN. *Fermentforschung* 1, 58–62(1914).—Heat coagulation of protein leaves in the filtrate, traces of protein which may influence the ninhydrin reaction. In terms of the micro-N detn. these traces are within the limits of exptl. error and are negligible. Flatow's procedure of deproteinization by shaking with toluene is claimed to be even less effective. Heat coagulation of protein and micro-N detn. in the filtrate was adopted as the most accurate method for demonstrating the decomposing action of serum on substrate. The control mixt. consisted of inactivated serum plus organ, since physiol. salt soln. plus organ control mixt. gives less N in filtrate than inactive serum plus organ, which may lead to erroneous conclusions. The results obtained by this method were in accord with those obtained by other methods. Pregnant serum acting upon placenta tissue increased the amt. of non-coagulable N in the filtrate. Of non-pregnant human sera tested only 2 cancer sera produced such an increase.

W. A. PERLZWEIG.

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A rapid test and quantitative method for the determination of small amounts of esterase. A. BACH. *Fermentforschung* 1, 151–4(1914).—The method depends upon the previously stated principle (cf. *C. A.* 8, 1969) that it is only after the splitting of phenol esters by the aminoacidase that the phenolase, which coexists in the tyrosinase, produces colored substances by oxidation. Since phenolase or peroxidase plus H_2O_2 does not attack unsplit phenol esters it is possible to detect even traces of esterase by the use of this oxidizing system. Guaiacum-CO_2 was chosen as a convenient phenolic ester for colorimetric detn. and wheat bran was used as the peroxidase carrier. The juice of a fresh fungus which abounds in oxidase, oxidizes guaiacum-CO_2 directly, while the phenolase obtained from it by pptn. with alc. is without effect upon the guaiacum. Esterase is therefore contained in the fresh juice along with the phenolase. Of rabbit organs the liver is the richest in esterase. W. A. PERLZWEIG.

Dextrose colorimeter. PHILIP ATLEE SHEAFF. Phila. *J. Am. Med. Assoc.* 65, 1181–2(1915).—An illustrated description is given of app. for use in the Kleiner method for the rapid estn. of dextrose in urine (cf. *C. A.* 8, 3062). L. W. RIGGS.

Differentiation between exudates and transudates. B. MAIOLO. *Policlinico* 22, No. 32(1915); *J. Am. Med. Assoc.* 65, 1067.—M. applied on an extensive scale the tests devized by Montz, Rivalta, Barberio and Gagni. He found the Rivalta and Barberio tests simple and reliable (cf. *J. Am. Med. Assoc.* July 10, 1910, 178). L. W. RIGGS.

Microanalysis of the urea in the blood. COMBE AND M. LEVI. *Revue med. suisse romande* 35, No. 8(1915); *J. Am. Med. Assoc.* 65, 1146.—Two drops of blood are drawn, most conveniently after scarifying, with a suction glass and bulb, the glass opening air-tight into a test tube containing dil. $Na_3C_6H_5O_7$, and the urea is detd. by means of the compd. which it forms with $Hg(NO_3)_2$. Comparison with other tests shows the method to be reliable. L. W. RIGGS.

Preparation of peptone by decomposition of the cells of beer yeast and the role of this peptone in fermentation. E. VLAHUTA. *Bull. acad. sci. Roumanie* 3, 123–31 (1914–5); *J. Chem. Soc.* 108, I, 485.—A résumé is given of the various theories advanced to explain the processes of fermentation, from the time of Liebig up to the present time. V. believes that a peptone obtainable from yeast cells is capable of bringing about fermentation. This peptone is obtained by adding in small quantities 100 g. of fresh beer yeast, previously submitted to 50–100 atms. pressure, to 70% H_2SO_4. The acid is kept cold by a freezing mixt., and after all the yeast has been added, the emulsion is kept in the freezing mixt. for 3 hrs., and finally allowed to come to atm. temp. and to remain for 3 days. Add the emulsion dropwise to 1500 cc. of ice-cooled H_2O, dil. to 2000 cc., add $Ba(OH)_2$ till the soln. is faintly alk., filter off $BaSO_4$ on a plaited filter, using a filter pump at the end; remove excess of $Ba(OH)_2$ by the addition of the exact amt. of very dil. H_2SO_4 and dil. to 2000 cc. A yellowish, faintly acid soln. of peptone (free from H_2SO_4 or $Ba(OH)_2$) is obtained, which gives the biuret and all other reactions of protein substances. The fermentative action is tested by taking 20 cc. of the soln., adding 0.2 cc. of toluene and quantities of dextrose or sucrose, and measuring the vol. of CO_2 liberated in a measured time. Definite fermentation occurred, tables of results showing that the action is about $^1/_{40}$ that of the Buchner prepns. F. W. SMITHER.

A biological test for arsenic. HERMANN PRINZ. Univ. Penn. *Dental Cosmos* 57, 790–4(1915).—The av. wt. of a sound, fresh tooth pulp was found to be 15 mg. The As present in 10 pulps, which had been killed with arsenical fiber *in vivo*, was detected as follows: The finely divided pulps were added to a paste of bread crumbs, which was then sterilized. *Penicillium brevicaule* was added and the culture incubated

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several days at body temp. The AsH_3 and its related ethyl compds. (formed by the action of the mold on the As present in the killed pulps), were displaced by Hg, and passed through a Marsh tube, obtaining a mirror of As. JOSEPH S. HEPBURN.

The electrocardiograph. R. H. KAHN. Prague. *Ergebnisse der Physiologie* 14, 1–252(1914). J. S. HEPBURN.

A new serological method applied for the first time to tuberculosis. J. HECKMAN. *Folia microbiologica* 3, *Heft* 2, 15 pp.(1914).—A certain substance found in human serum is capable of altering the color of stained horse-fibrin. Egg albumen and lung and kidney tissue stained with eosin are likewise affected. On the addition of other unstained protein-substances such as egg albumen, tuberculin, kidney tissue, etc., the color-change of stained horse fibrin by human serum is arrested. Since tuberculin was found to arrest the change of stained fibrin by tubercular more than by non-tubercular serum, a serological method of diagnosis of tuberculosis was developed. The ratio of the smallest serum dilution in which fibrin is no longer affected to the serum dilution in which a 2% tuberculin soln. fully prevents the change of color of fibrin is lower for tubercular than for non-tubercular serum. This index the author proposes to establish by further expts. W. A. PERLZWEIG.

Modification of the Abderhalden test. J. BRONFENBRENNER, *et al.* Pittsburgh. *J. Am. Med. Assoc.* 65, 1268–71(1915).—A general review of work upon this test is given with over 75 references. The conclusions following the experimental work of the authors are: The tests depend on the presence in the serum of specific substances which are not of a fermentative nature. The substratum is not digested during the test. Dialyzable split products originate from the serum as a result of its autodigestion and not from the substratum. Analysis of the test shows that it consists of 2 phases, and this gives a basis for a useful modification of the method. The procedure for this modification is the following: After remaining overnight in contact with suspected serum in the ice box, the placenta (or other substratum) is centrifuged, washed to remove any serum which may adhere to it, and placed in a new thimble with any fresh serum that happens to be on hand. The best for this purpose is serum from a guinea pig kept without food from 6 to 8 hrs. to free its blood from dialyzable ninhydrin reactive substances. In testing for pregnancy serum from the male guinea pig must be used. L. W. RIGGS.

Note on urology. A. ROUSSELET. *J. pharm. chim.* 12, 132–3(1915).—Usually the data of urine analysis are referred to total vol. per 24 hrs. In certain cases, *e. g.*, diabetes due to hyperhepatitis, examn. of fractions is of interest (Gilbert and Lereboullet). R. gives in tabulated form the results of examn. of 6 fractions of 4 hrs. interval, beginning at noon. The vols. were 420, 380, 260, 480, 230, 180 cc., the amts. of sugar 10.5, traces, 3.7 g., traces, traces, traces; urea, 9.5, 10.5, 6.9, 10.3, 4.9, 4.75 g.; NaCl 2.45, 4.6, 2.2, 5.4, 3.65, 2.55 g.; indoxyl + only in the 4th, 5th and 6th fractions, strongest in the 5th; urobilin + only in the first 3; biliary pigments only in the 1st. S. WALDBOTT.

Glucosuria and lactosuria. F. FARGES. *J. pharm. chim.* 12, 188–94(1915).—When the amt. of dextrose in urine is below 4 g. per l., the typical broom-like crystals of the osazone appear compact and rounded, simulating lactosazone. This is due to colloidal retardation of crystn. caused by creatine products in urine. To identify dextrose or lactose in urine, defecate 80 cc. of urine with 40 cc. of $Hg(NO_3)_2$, add, drop by drop, a 25% soln. of NaOH to exact neutrality, fill up with H_2O to 200 cc., and filter. Remove all Hg by H_2S, and H_2S by boiling; concentrate to 8 cc. To 2 cc. thereof add 2 cc. of $PhNHNH_2$.AcOH and heat on b. waterbath for $^1/_2$ hr. On cooling, the typical osazone will be formed. The urine of a diabetic patient who was given

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250 g. of lactose per day, contained 4.48 g. of sugar per l. Without defecation, osazones were obtained, apparently indicating lactosuria. But with the method described, typical crystals of glucosazone were formed, m. 221° (true m. p. 230–232°, Bertrand). The same m. p. was found on adding to non-diabetic urine 3 g. per 1000 of dextrose. Lactosazone m. 192°. When glucosazone and lactosazone are together, H_2O will dissolve the latter only. It is also sensitive to heat. These expts. show that lactosuria is of rarer occurrence than it is usually believed. S. WALDBOTT.

A specific reaction of picric acid. G. RODILLON. *J. pharm. chim.* 12, 177–9 (1915).—Biliary pigments give color reactions very similar to those of picric acid; but the following is specific: Treat 250 cc. of urine with strong HCl, then ext. 3 times each with 50 cc. benzine or Et_2O and evap. to dryness. Take up with a few cc. of H_2O, add 1/4 of pure official HCl, and Zn. The yellow color quickly disappears. Decant, add 10 drops of official H_2O_2, shake, and superpose without mixing, pure NH_4OH soln. 2 cm. high. If picric acid is present, two colored rings will appear at the zone of contact; violet-blue in the upper, alk. layer is specific for the presence of picric acid. The lower layer is of violet-rose color. Upon agitation, the liquid remaining acid, the color becomes violet-blue. Beer may be examd. in the same manner; solid foods, etc., are first extd. with 250 cc. of warm H_2O. S. WALDBOTT.

A new method for the bacteriological cholera diagnosis. H. ARONSON. *Deut. med. Wochschr.* 41, 1088(1915).—The reagents necessary for a selective culture medium for cholera bacilli are made into tablet form. S. AMBERG.

Use of a colorimeter with formol-titrations (ADLER) 16.

CARPENTER, T. M.: **A Comparison of Methods for Determining the Respiratory Exchange of Man.** Washington, D. C.: Carnegie Inst. 265 pp. $2.50.

C. BACTERIOLOGY.

ERNEST D. CLARK.

Differentiation among species of Penicillium using their physiological characteristics. W. WOELTJE. *Ber. deut. botan. Ges.* 32, 544–7(1914).—W. examd. the behavior of individual penicillia towards NH_4 salts (as a N source), and towards sound, ripe fruit, etc. The behavior with $(NH_4)_2SO_4$ was characteristic, some giving a normal green, others failing to give the color. NH_4NO_3 behaved similarly. Higher temps. acted variously on the conidia. W. thinks that a knowledge of the behavior of individual fungi would be of greater value in their identification than a knowledge of their microscopic qualities. B. H.

Environmental studies of streptococci with special reference to the fermentative reactions. JEAN BROADHURST. Ithaca. *J. Infect. Dis.* 17, 277–330(1915).—In this paper is given a condensed account of the results obtained in a study of 767 strains of streptococci of which all but 23 were freshly isolated for this purpose. The results show the constancy of the streptococci (measured chiefly by fermentative activities, but also by other characteristics and powers, as, for example, colony characteristics on agar, effects upon blood agar, gelatin, etc.), as exhibited at varying periods after isolation, and as affected by variations in environment within the range of possible lab. variations in media, technic, etc., and more extreme conditions, designed to induce changes in streptococci. Characteristics of the streptococci on isolation from various sources or habitats were studied to ascertain whether streptococci bear or retain sufficient impress of a given environment to yield diagnostic differences—differences distinctive enough, for instance, to aid in practical sanitary investigations. A complete bibliography of previous work along this line is given. JULIAN H. LEWIS.

The disinfecting strength of thigan. WALTER FREI. Univ. Zurich. *Centr. ...k., I Abt. Orig.* 76, 363–6(1915).—Thigan is the patented name of a

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2% soln. of a Ag salt of a synthetic acid containing S (cf. *Münch. med. Wockschr.* 29, 1627(1914)). Its disinfecting properties are illustrated in expts. comparing its action on bacteria with protargol and lysol. It is particularly potent against gonococci.
JULIAN H. LEWIS.

Comparative experiments on the resistance of different acid-fast bacteria against antiformin. ANNA V. SPINDLER. Engelsen, Univ. Zurich. *Centr. Bakt. Parasitenk., I Abt.* 76, 356–62(1915).—A 1% soln. of antiformin completely inhibits the growth of *Staphylococcus, B. mesentericus,* smegma bacillus, grass bacillus, butter bacillus, and *B. tuberculosis anguis.* Microscopically it produces a change in the staining properties of the bacilli and in the appearance of the cells. The smegma, grass, and butter bacilli were dissolved in ½ hr. by a 15% soln. of antiformin. *B. tuberculosis anguis* was not dissolved completely by a 25% soln., but was by a 50% soln. in 24 hrs. The *B. tuberculosis humanis* and *bovinus* were not essentially changed in 4 days by a 50% soln.
JULIAN H. LEWIS.

The splitting of casein by Streptococcus lactis. CHR. BARTHEL. Stockholm. *Centr. Bakt. Parasitenk., II Abt.* 44, 76–89(1915); see *C. A.* 9, 668. J. H. L.

An addendum to the paper on the nitrogen metabolism of the molds. WIDAR BRENNER. *Centr. Bakt. Parasitenk., II Abt.* 44, 304–5(1915).—In this short note several corrections are made of a previous paper (cf. *C. A.* 8, 2895). JULIAN H. LEWIS.

D. BOTANY.

CARL L. ALSBERG.

Influence of the outer medium on the turgor-pressure of several algae. A. BUCHHEIM. *Ber. deut. botan. Ges.* 32, 403–6(1914).—In a study of turgor regulation of *Cylindrocystis brebissonii* and *Spirogyra* in solutions of an electrolyte and nonelectrolyte NaCl and sucrose), the pressure was different in the two media. In sucrose solution the turgor-increase followed Weber's law. In NaCl solution the turgor-pressure was more nearly proportional to the outer concn.
B. HOROWITZ.

The causes for plankton development in the Lietzen Sea. R. KOLKWITZ. *Ber. deut. botan. Ges.* 32, 639–66(1914).—K. describes water-blossoms that occur in the Lietzen Sea. In winter *Stephanodiscus Hantzschianus* is found and in the summer *Oscillatoria agardhii.* Results are given of analyses of the sea-water and of the mud. A comparison of these chem. analyses with the contents of plankton [the free-swimming organic world on the surface of the sea, composed, to a large extent, of diatoms] shows that the mineral content has no appreciable influence on the production of plankton.
B. HOROWITZ.

Algae that dissolve lime minerals. E. BACHMAN. *Ber. deut. botan. Ges.* 33, 45–57(1915).—Lime minerals over which water does not flow may serve as a home for algae. These algae belong to the *Schizophyceae,* most of them coming under the head of *Chroococcaceae.* The solubility of the lime mineral results from the sepn. from the algae of S, which then combines with the Ca of the mineral to form a sol. Ca salt, thereby liberating the equiv. quantity of CO_2. Oxalic acid cannot be considered as the solvent. The vol. of the cavities formed is greater than the vol. of the algae. The algae free an excess of S. These lime algae are more porous than the lime lichens; hence the aerobic algae are better solvents of lime minerals than the lichens.
B. HOROWITZ.

Discoloration of toadstools. D. J. VAN DER VEN. Arnhem. *Chem. Weekblad* 12, 247–55(1915).—The discoloring of toadstools is ascribed to the action of oxidases on certain constituents; *e. g.,* the blue color formed on breaking *Boletus cyanescens* is due to the action of laccase on muscarine, which is stated by Ruys to be a constituent of *B. cyanescens.*
GEORGE W. MOREY.

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Magnesium in albicant and chlorotic plants. EVA MAMELI. Univ. Pavia. *Atti accad. Lincei* **24**, I, 262–7(1915).—In a preceding paper (*C. A.* **6**, 1172) M. showed that the amt. of chlorophyll formed in the assimilative organs of plants is related to the amount of Mg supplied to the plant. In the phanerogam and cryptogam plants grown in solns. free from Mg the stalks and leaves were completely etiolated or pale green. The same species grown in solns. containing variable amts. of Mg developed an increasing coloration with increasing amts. of Mg. The Et_2O exts. of these plants examd. colorimetrically showed the same gradation with the increasing Mg content of the nutrient solns. The present paper is intended to demonstrate this relation by means of quant. detns. of Mg in green leaves and in white or yellow leaves from the same plant. There are as yet no conclusive results on this topic since the material used by various authors has varied so much; they have used (1) leaves normally albicant from plants in which albinism was fixed as a hereditary character; (2) leaves etiolated by pathological chlorosis of recent origin; (3) leaves etiolated by growth in the absence of light; (4) yellow leaves collected in the autumn season. It is clear that the general physiological conditions of the non-colored leaves will vary in all of the 4 cases. The data for the first case especially are poor so that M. has made accurate Mg detns. on most of the species showing these characteristics: *Vinca minor*, var. *fol. variegatis; Pelargonium zonale*, var. *fol. var.; Pandanus javanicus*, var. *fol. var.; Polygonium orientale*, var. *fol. var.; Acer negundo* var. *fraxinifolia; Spiraea lobata*, var. *fol. var.; Funkia lancifolia*, var. *albo-marginate; Evonymus paponicus*, var. *fol. var.; Haegopodium podagraria*, var. *fol. var.* Similar detns. were made on leaves from chlorotic branches of *Camellia japonica, Rosa bengalensis* and *Catalpa bignonioides*. The analyses are given in tables. It was found (1) that in 2 of the 3 chlorotic plants the leaves from the part affected by chlorosis showed a higher Mg content than normal leaves. Thus the physiological cause of the chlorosis affects the salt absorption variously. (2) In the albicant plants (8 out of 9) the Mg content in the green parts was greater than that in the white parts of the same individual. This confirms the existence of a strict physiological relation between Mg and chorophyll, which is in accordance with Willstätter's statement that chlorophyll contains Mg. E. J. WITZEMANN.

The direct assimilation of free atmospheric nitrogen in vegetation. EVA MAMELI AND GINO POLLACCI. Ist. bot., Pavia. *Atti accad. Lincei* **24**, I, 966–71(1915); cf. *C. A.* **9**, 2103.—In a preceding paper (*C. A.* **6**, 1172) numerous expts. on the direct assimilation of N of the air by plants ranging from algae to higher phanerogams were described. The exptl. errors which were carefully avoided were due to (1) the incomplete sterilization of the culture, (2) the presence of N compds. in the air, (3) the incomplete development of the plant, (4) the analytical methods of detg. total N. The cultures were made in liquid media and in part in pure quartz sand and Knop's nutrient soln. minus the N compds. was used. The analyses were made indirectly (*i. e.*, the N in the seeds and in the substrate and then again in the plant and the substrate after growth were detd.; the difference showed the N gained or lost), and directly by analyzing the air in which the plant was confined both before and after the expt. The results from the cultures and the analyses agree and it was concluded that the property of assimilating free N from the air which is attributed to the plasma of bacteria and is assumed for algae may be extended to the vascular cryptogams and to the phanerogams, *i. e.*, to vegetable plasma in general by controlling the culture (*i. e.*, chemical) conditions that have a strong physiological influence on the phenomenon. It is for the last reason that plants obtained by cultures made in the lab. show a relatively low assimilation of free N and it may be that under proper conditions plants may show a greater activity in assimilation. M. and P. discuss their main results with individual plants in detail and then discuss the results of Oes (*C. A.* **7**, 3146) and Molliard (*C. A.*

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9, 1930) in some detail. In the main, the earlier results of M. and P. are verified. The expts. of Molliard are criticized because (1) the nutrient soln. was not suitable, (2) it was supplied to the plant in insufficient quantities, and (3) the analytical methods were inaccurate. Cf. *C. A.* 8, 3809. E. J. WITZEMANN.

New tannin reaction and its relation to anthocyanin. K. PECHE. *Ber. deut. botan. Ges.* 31, 462–71(1914).—Sections of the leaf or rind of *Prunus laurocerasus* when heated with a mixt. of equal parts of KOH (20%) and HCHO yield a bluish green coloration in those cells which contain tannins. The color is changed to red with acids. The colored substance resembles anthocyanin, except in its solubility. B. H.

The effect of potassium iodide, methylene blue and other substances applied to the embryo sacs of seed-plants. D. T. MACDOUGAL. Tucson, Ariz. *Proc. Soc. Exp. Biol. Med.* 12, 1–3(1914).—Ovaries of a *Scrophularia*, native to the mountain tops of Ariz., treated in 1911 with a soln. of 1 pt. KI to 40,000 of distd. H_2O and the seedlings grown in 1912, included 2 individuals unlike the parent strain. These and their progeny are unlike their progenitors in the color-pattern of the flowers, the water relations of the stems, the degree of differentiation of the tissues, the shape of the wings, of the stems, the form and size of the flowers, the growth-correlations and venation of the leaves. The continuance of these features in the successive generations indicates a permanent modification of the germ-plasm. Studies on the behavior of methylene blue and other dyes, in the ovaries, show that, in some plants introduced solns. may be taken up by the placenta and conducted through the funicular stalk to the antipodal region of the embryo-sac, finally staining the egg cell. V. C. MYERS.

Action of some organic substances upon plants. GIACOMA CIAMICIAN AND CIRO RAVENNA. *Ann. chim.* 4, 5–27(1915).—The roots of tobacco plants were inoculated with various org. compds. and the resulting influence upon the alkaloid (nicotine) content of the plants after a certain period of growth was observed. When nicotine itself was injected, a slight increase in the nicotine content of the plant was observed, the increase being less than the quantity injected. From a study of the isoamylamine content of resting and of germinating tobacco seeds, the authors conclude that there may be a generic connection between this substance and nicotine. Alkaloidal exts. of tobacco plants failed to yield pyrrolic compds., the presence of which was reported by Pictet and Court (*Arch. sci. phys. nat.* 19, 329(1905)). Indian corn plants (maize) when inoculated with gallic acid failed to produce compds. of glucoside or tannin nature. Acetone when injected into plants did not cause the formation of glucosides susceptible to the action of emulsin. The acetone is thought to be eliminated by the plant by a process of oxidation. W. A. PERLZWEIG.

The assimilation of atmospheric nitrogen by plants. FRANÇOIS KÖVESSI. *Rev. gen. botan.* 25, 405–15(1914); *Bull. Agr. Intelligence* 5, 1291; cf. *C. A.* 7, 1739.—K. confirms previous conclusions concerning the utilization of the free N of the air by plants. Plants were grown, (1) in an atm. without N (oxygenated), and (2) in the open air. The 2 series gave the same reactions, showing the presence of protein in the hairs, particularly in the specialized hairs studied by Jamieson and by Zemplén and Roth, who attributed to them the power of fixing atm. N. Various protein reactions were applied. The presence of proteins in the hairs grown in a N-free atm. shows that it is due to cell growth and normal nutrition and not to a direct assimilation of atm. N. The theories of J. and of Z. and R. are untenable. W. A. P.

E. NUTRITION.

PHILIP B. HAWK.

NORMAL.

Metabolism of creatine and creatinine under normal conditions and as a result of suppression of hepatic circulation. V. SCAFFIDI. *Arch. ital. biol.* 61, 153–68

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(1914); *Expt. Sta. Record* 32, 764.—The exptl. ingestion of creatine and creatinine by lab. animals gave evidence that the liver is not a necessary organ for the metabolism of creatine and creatinine. E. H.

Protein minima for maintenance. THOMAS B. OSBORNE AND LAFAYETTE B. MENDEL. Conn. Agr. Expt. Station and Yale Univ. *J. Biol. Chem.* 22, 241–58 (1915).—"Rats fed upon rations comparable in their make-up in every way except with respect to the content of protein can be maintained in body wt. with a smaller intake of lactalbumin than of any other protein here reported. Ranges of 7 to 15 mg. of lactalbumin per g. of rat per week represent minima lower than those found for casein, edestin, milk proteins, or gliadin, not to mention the impossibility of maintenance with zein. Whereas maintenance could be secured very frequently with a lactalbumin content of less than 5% in the diet, this was rarely the case with the other proteins. For edestin and casein a corresponding efficient intake seems to be about 20 mg." Analyses of the feces has shown that the results are not due to defective utilization in the alimentary tract. "The apparently greater efficiency of lactalbumin, in contrast with the other proteins, is in harmony with the observations of the apparent economy of this protein as a supplement to deficient rations." A. P. LOTHROP.

The excretion of free and conjugated phenols and phenol derivatives. OTTO FOLIN AND W. DENIS. Mass. General Hosp. and Harvard Med. School. *J. Biol. Chem.* 22, 309–20(1915).—When the amts. are detd. by the authors' new method (*C. A.* 9, 3263) the excretion of total phenols in normal urine is much greater than is indicated by figures recorded in the literature. From 0.3 to 0.5 g. of total phenols in 24 hr. samples of urine is generally observed. There is no evidence of the existence of a specifically abnormal production of phenols in any one disease. The amts. of free phenols vary from 50 to 87% of the total phenols. Infants and children show practically the same ratio between free and conjugated phenols as adults in many cases, but often nearly the whole is excreted in the free form or as salts. The distribution of the phenols is substantially the same in the urines of animals as in man. "The phenols are by no means quant. converted into conjugated phenols. The detoxication process involved in such conjugations appears therefore to furnish only a partial protection against the toxic or deleterious effect of the phenol products formed by putrefaction in the intestinal canal. In any given individual man or animal, the total phenol excretion tends to vary directly but not proportionally with the protein intake."
A. P. LOTHROP.

The relation between the administration of tryptophan to dogs and the elimination of kynurenic acid in their urine. ANNIE HOMER. Univ. Cambridge, Univ. College, Lister Inst. and Univ. of Toronto. *J. Biol. Chem.* 22, 391–405(1915).—Tryptophan in varying doses was administered to dogs of different sizes and ages and the output of kynurenic acid in the urine was estd. by Capaldi's method (*Z. physiol. Chem.* 23, 92(1897)). The dogs were fed a diet of very low purine content as uric acid interferes in the estimation of kynurenic acid. Kynurenic acid, given subcutaneously or by mouth, is eliminated unchanged in the urine. There is no simple relation between the amt. of tryptophan administered and the kynurenic acid eliminated in the urine. An av. of about 10% of the theoretical amt. of kynurenic acid which could be formed from the ingested tryptophan was obtained in the urine. Young animals utilize tryptophan more completely than a fully grown dog. The N output is not materially increased by feeding tryptophan. Flooding the digestive organs with tryptophan does not lead to the excretion of the corresponding amts. of kynurenic acid but no unchanged tryptophan nor any other indole deriv. could be detected in the urine "Kynurenic acid apparently is not readily capable of further utilization in the body of the dog, as all which is administered is excreted in the urine. It is therefore justi

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fiable to assume that all the tryptophan converted into kynurenic acid in the body is excreted in the urine as such. The production of kynurenic acid from tryptophan does not represent either the only or the main line of breakdown of tryptophan in the animal body. A certain amt. of the tryptophan administered becomes "side-tracked" into kynurenic acid while the remainder is utilized in some direction not yet elucidated, but which may probably have intimate connection with the furnishing of the particular substance or substances necessary for the maintenance of life of the individual."

A. P. LOTHROP.

Studies in infant metabolism and nutrition. Preparation and composition of protein milk. A. M. COURTNEY AND H. L. FALES. New York. *Am. J. Dis. Children* 10, No. 3(1915); *J. Am. Med. Assoc.* 65, 1138.—In the prepn. of protein milk C. and F. avoid stirring too much or too long when adding the rennin, leaving the milk during curd formation in a cold place, and unnecessary handling of the curd in removing whey, washing or passing through the sieve, or subsequently heating beyond that required in feeding. The compn. of the protein milk obtained by the authors was: fat 3–3.5, sugar 1.8–2.0, protein 3.6–4.0, ash 0.65%. L. W. RIGGS.

Protein need of infants. B. R. HOOBLER. Detroit. *Am. J. Dis. Children* 10, No. 3(1915); *J. Am. Med. Assoc.* 65, 1138.—H. favors a low protein diet with 7% of the caloric need in protein calories. This is attained by feeding 5% of the body wt. in skimmed, whole, or top milk, adjusted to keep the protein cal. near 7% by the addition of sugar or cereal. L. W. RIGGS.

Casein milk feeding in infancy and childhood. WALTER GELLHORN. Seattle. *J. Am. Med. Assoc.* 65, 953–5(1915).—After discussing various modified milks G. proposes the following made from 4% cow milk: 500 g. skimmed milk (skimmed by dipper after 2 hrs. standing), 46.5 g. of cream (the first from the top), 495 g. barley or oatmeal water, and 10.5 g. Na caseinate. The mixt. is boiled off if used therapeutically, and pasteurized for prolonged feeding periods. It represents a skimmed milk to which 10% of cream and 2% of casein have been added. Its compn. is protein 30, fat 11.5, ash 4.6, lactose 23, Cl 0.5, P_2O_5 1.4, CaO 0.6, K_2O 0.8, Na_2O 0.8%. Its calorific value after the addition of 5% of *d*-maltose is about 440 cal. per liter. It contains $^1/_2$ as much fat as albumin milk, $^2/_3$ as much Ca and 0.8% more of lactose. A review of 163 cases is given. Casein milk feedings appear to be successful in cases of abrupt weaning, and in the majority of nutritional disorders. L. W. RIGGS.

The metabolism of the amino acids in the organism. III. Action of the kidney on the amino acids added to blood or to circulating Ringer solution. CAMILLO ARTOM. *Atti accad. Lincei* 24, I, 468–75(1915).—Expts. of Folin and Denis (*C. A.* 6, 2250) and Van Slyke and Meyer (*C. A.* 6, 3448) showed that amino acids introduced into the circulation disappear rapidly and almost completely from the blood. The purpose of the following expts. was to det. the behavior of the kidney in this process. Van Slyke and Meyer found that the kidney of the dog can store twice as much amino acid as the muscle of the animal. It is only excreted when the excess is too great. Lanzillota (*Arch. fisiol.* 12, 429(1914)) found that perfusion of a 0.3–0.4% glycocoll-alanine-tyrosine-asparagine soln. in Ringer soln. through the kidney with an Aducco app. gave an amino acid secretion of almost unchanged concn. There was usually some diminution in the first 3 but none in the asparagine. A. detd. the amino acids in the liquids and organs before and after perfusion; the NH_3 was also detd. in the liquids and organs to learn whether or not the NH_3 indicates the amt. of amino acids burned. As circulating liquids Ringer soln. was used in the 1st series and blood in the 2nd in order to det. to what extent the substitution of a physiologic soln. modifies the amino acid metabolism of surviving kidney. Solns. of glycocoll, alanine and neutralized asparagine were used. Full exptl. and numerical details are given. It was found that on cir-

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culating blood containing large concns. of amino acids (0.8%) in the isolated kidney there is always a diminution of the amino acid content of the blood after circulation; it may be as much as 17%. Of the amino acids not recovered in the circulating blood part 3–5% of that used or 25–50% of that lost from the blood was recovered from the organ. Therefore, the amount of amino acid actually decompd. was 5–10%. Using Ringer soln. instead of blood the diminution in amino acid was 16.4% (in 1 expt. with asparagine it was 30%), which is nearly the same as with blood, but the amt. of amino acid recovered from the organ is relatively greater. The results show that the phenomenon of accumulation of amino acids in the kidney is very conspicuous either when circulated in blood or Ringer soln., but in the second case is somewhat greater. The results in general show that more or less of the amino acids are effectively destroyed. **IV. The action of the intestine on the amino acids added to circulating blood or to Ringer solution.** UGO LOMBROSO. *Ibid* 475–82.—The influence exercized by the intestine on the amino acids that come to it in the circulating blood has not been discussed directly. Much work has recently been done to det. indirectly what happens to the amino acids that pass through the intestinal mucosa during alimentary absorption. The soln. of this question is of great importance in detg. in what form the proteins penetrate the human organism. According to some they do not undergo a profound hydrolysis; only a small part is absorbed as amino acids. Others insist that there is a complete hydrolysis before absorption. The latter also differ as to whether the proteins are again synthesized in the mucosa or elsewhere. A review of this work shows how difficult it would be to draw definite conclusions from these data. L. has conducted expts. on the intestine (the technic is described) similar to those described above. These expts. showed that causing blood containing high concns. of amino acids (0.8%) to circulate through isolated kidney always causes a diminution of amino acids up to 20%. Part of the amino acids removed may be found accumulated in the exptl. tissue, but this deposit is always somewhat less and in some cases not only is no deposit found but some of the amino acid originally present in the tissue has disappeared. In this respect the intestine differs from the other tissues previously studied. The results of this expt. suggest a new series of expts. on the behavior of amino acids that are already present in the intestine. If the phenomenon observed incidentally here is due to their decompn. it will be even more marked when normal blood is used instead of blood charged with amino acid. When Ringer soln. was used there was a large quantity of amino acid absorbed but less than in the case of blood. The deposit of amino acids in the tissue was greater with Ringer soln. and sometimes was equal to the amt. removed from the soln. **V. The destiny of the amino acid contained in the lumen or in the intestinal mucosa.** UGO LOMBROSO AND CAMILLO ARTOM. *Ibid* 863–9.—In the preceding study of the behavior of amino acids circulating with blood in intestinal tissue it was observed that there is a more or less notable increase in the amino acids of the tissue, and in 1 case the opposite effect. In the last case the intestine of a fed dog in which there was already a large amt. of amino acids was used. This may be explained by assuming a different distribution of amino acids in the various parts of the intestine so that the amino acid content of the part used is different from that in which it was detd. This was ruled out by analyzing the part adjoining that used on both ends. Other explanations are that the amino acids are absorbed as such and emitted unchanged to the blood stream (*C. A.* 6, 3448) or that before entering the blood they undergo a synthesis (Abderhalden, etc.) or that the amino acids are deaminated by the endo-cellular enzymes of the intestinal epithelium (Pavlow, Nenki, etc.). The last hypothesis furnishes a favorable argument for the results of Bostock (*C. A.* 6, 1912) who found that enteric exts. destroy amino acids *in vitro* to form NH_3 but the results of Folin and Denis (*C. A.* 6, 2250) on the NH_3 content of mesenteric

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blood before and during protein digestion, in which no increase of NH_3 was observed, are contrary to this. The expts. of the preceding paper were repeated by placing the circulating liquids in the lumen of the intestine in contact with the epithelium. It was found: (1) The quantity of amino acids found in the blood that has been circulated through a segment of intestine is constantly increased. (2) In expts. without the introduction of amino acids from the outside one observes nearly always that the increase in the amino acids in the blood is greater than the amt. of amino acids that disappears in the intestinal mucosa, which shows that several phenomena must interfere in a way to prevent the easy deamination of the amino acids. Thus it is possible that there are antagonistic enzyme actions involved which build up and break down these derivs. in a complex and variable manner and it is not possible to say which action is prevalent. (3) In the expts. in which a considerable amt. of pure amino acids was introduced an increase in the amino acid content of the blood was observed, but it was always less than the diminution observed, after the circulation, in the amino acid content of the intestine. The absolute deficit was 30%. In all the expts. the acetone content was appreciably changed. The NH_3 content was always increased somewhat. There is always a diminution in the NH_3 content in the intestinal tissue after circulation, which seems to indicate that there is an overflow of NH_3 salts into the blood; this coincides with Folin's opinion. The data do not make it possible to exclude either of the hypotheses as to the entrance of the protein substances into the blood. **VI. The metabolism of the amino acids circulating in functioning muscle.** Ugo Lombroso and Ludovico Paterni. *Ibid* 870–6.—In some earlier expts. (*C. A.* **9**, 2104) it was found that when various amino acids in Ringer soln. were circulated in muscular tissues there is a greater or less diminution of the amino acid content of the circulating liquid. The amino acids that disappear are recovered completely or nearly so from the muscular tissue, so that it has not taken any part in the metabolism of the muscle. But if the amino acids are dissolved in blood of the animal and circulated, the diminution is greater and only a part of the amino acid are recovered from the muscle. These expts. were conducted with a muscle in repose and it was thought desirable to repeat the expts. on actively functioning muscular tissue. Little is known of the exchange of protein substances in functioning muscular tissue. Pugliese (*Arch. ital. biol.* **55**, 359(1901)) circulated blood in tetanized muscles and found a rise in the quotient of seroprotein not coagulable with heat. From L. and P.'s expts. it was found that (1) circulating amino acids in blood in functioning muscular tissue causes a diminution in the amino acids in the blood to a greater extent than in similar expts. on muscles in repose. (2) The phenomenon of accumulation of amino acids in muscular tissue, which in muscle in repose was the principle cause of the diminution of amino acids in the blood, is not present in the expts. with functioning muscle; in some cases one obtains a diminution in the content of amino acids preëxisting in the tissue. (3) In the expts. in which blood was circulated in functioning muscle without adding amino acids, a drop in the % of amino acids in the blood and in the muscular tissue was observed. (4) The amt. of NH_3 that was recovered in the circulating blood is variable in the various expts. but the oscillations have no relation to the behavior of the amino acids in the sense that a greater decompn. of amino acids always corresponds to an equivalently greater amt. of NH_3. (5) The results on the formation of acetone compds. are still more variable; in the expts. with amino acids it was always quite large and in those with blood it was always small. This result is important since it shows that muscular tissue, contrary to the statement of Embden, is capable of forming acetone compds. in considerable amts., and also shows that alanine, which according to the work of Embden on the liver may inhibit the production of acetone, is able instead to give origin to it. Those cases in which there is a large disappearance of amino acids in the blood, in which a corresponding amt. of acetone

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could not be found, may be explained by the fact that muscular tissue itself destroys the acetone as was shown by Embden. The question of the relation between NH_3 and acetone is quite complex; other factors may intervene to complicate the process For instance, the acetone may come from other substances (fatty acids, glycogen) and the amino acids facilitate the formation of acetone by an action similar to that of a catalyst. It seems probable that the decompn. of amino acids may be due, at least to a large extent, to a process of combustion and not a synthetic process; that functional activity of muscle tissue increases profoundly its capacity of removing amino acids from the blood, not to sat. the muscle but for utilization in its metabolism.

E. J. WITZEMANN.

The origin of gastric hydrochloric acid. O. BERGEIM. Phila. *Proc. Soc. Exp. Biol. Med.* **12**, 21–2(1914).—B. presents data in support of the theory of Maley on the origin of gastric HCl. V. C. MYERS.

Phospho-nuclease as related to phosphorus and calcium metabolism. O. BERGEIM. Phila. *Proc. Soc. Exp. Biol. Med.* **12**, 22–4(1914).—B. makes this interpretation: the intestinal epithelium and leucocytes invading it, by virtue of the phospho-nuclease they contain, liberate from nucleic acid H_3PO_4, which dissolves $Ca_3(PO_4)_2$. Ca is carried partly in combination with the leucocytes and is necessary for nucleolytic action. In decalcification of bone the osteoblasts act in a similar manner. In ossification the osteoblasts split off acid Ca phosphate which hydrolyzes to the carbono-phosphate. V. C. MYERS.

The influence of beef fat on growth. T. B. OSBORNE AND L. B. MENDEL. New Haven. *Proc. Soc. Exp. Biol. Med.* **12**, 92(1915).—Among naturally occurring fats, butter fat, egg yolk fat, and cod liver oil have been shown to be effective as adjuvants to the above artificial dietary in promoting growth; lard, almond oil, and olive oil behave otherwise. O. and M. have found that beef fat is likewise capable of promoting renewal of growth when it has been checked on the lard diets; or if beef fat is incorporated with the food at an early period there is no cessation of growth until long after the time at which nutritive failures on the inadequate diets usually occur. The content of the growth-promoting substance appears to be smaller in beef fat than in butter fat. By fractional sepns. it can be obtained in the more liquid portions of the fat—the "beef oil." Beef oil and beef fat, like butter fat and cod liver oil, seem to exert a curative effect in certain affections of the eyes which the rats experience as the result of malnutrition. V. C. MYERS.

The formation of urea in the liver. D. D. VAN SLYKE, G. E. CULLEN AND F. C. MCLEAN. Rockefeller Inst. *Proc. Soc. Exp. Biol. Med.* **12**, 93(1915).—In dogs etherized and operated on at various intervals after feeding, the urea content of blood from the hepatic vein was from 3 to 20% higher than that of the portal blood. A similar increase in the urea content during passage of the blood through the muscle tissue of etherized dogs did not occur. V. C. MYERS.

The importance of the inorganic constituents of feeding stuffs. A. ZAITSCHEK Budapest. *Allatorvosi Lapok* **37**, 225(1914); *Bull. Agr. Intelligence* **5**, 1046.—Z. conducted investigations on the influence of the inorganic constituents of foodstuffs on the development of bone in young pigs. On an exclusively maize diet there was an increase in muscle substance and a loss of Ca, which was replaced by Mg. Later, with an increase in the quantity of maize and the addition of 5 g. of $CaCO_3$ there was a retention of Ca and a decreased retention of Mg. These changes were accompanied by an increased retention of P_2O_5. On a diet of barley and starch there was a retention of Ca, which was not sufficient, however, to ensure a corresponding development of bone. The daily addition of 3 g. $CaCO_3$ produced a high absorption of Ca and P_2O_5

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It is suggested that when feeding maize and barley, which contain sufficient P_2O_5 to growing pigs, $CaCO_3$ be used to replace the more expensive $Ca_3(PO_4)_2$.

W. A. PERLZWEIG.

Studies in adaptation of artificial food to human milk. H. J. GERSTENBERGER, *et al.* Cleveland. *Am. J. Dis. Children* 10, No. 4(1915); *J. Am. Med. Assoc.* 65, 1488.—By mixing varying proportions of different animal and vegetable fats, G. and his associates produced a fat nearly identical in its chem. characters to the fat of human milk. By replacing the cow milk fat in an artificial milk with the fat above described, in an emulsified (homogenized) state, a distinct advance is made in the adaptation of an artificial food as a substitute for breast milk. L. W. RIGGS.

ABNORMAL.

Experiments with *dl*-glyceric aldehyde. R. T. WOODYATT. Chicago. *Proc. Soc. Biol. Chem.; J. Biol. Chem.* 20, xxiii(1915).—Pure cryst. *dl*-glyceric aldehyde is capable of complete conversion into *d*-glucose, if given in low dilns. over a long time. If given in high concn. it fails to appear as glucose and apparently burns. By mouth doses of 1.7 g. per kg. body wt. caused diarrhea with unchanged triose in the stool and suppression of urine. Doses of 2.5 g. per kg. subcutaneously are lethal, but cause no diarrhea and no unchanged triose by any route. I. GREENWALD.

The excretion of creatine during a fast. F. D. ZEMAN AND PAUL E. HOWE. Columbia Univ. *Proc. Soc. Biol. Chem.; J. Biol. Chem.* 20, xviii(1915).—Since the recently reported interference of $AcCH_2COOH$ and Me_2CO with the detn. of creatinine has thrown doubt upon the presence of creatine in the urine of fasting men, this question was reinvestigated. The interfering substances were removed by the method of Graham and Poulton (*C. A.* 8, 954). Creatine was found in the urine in amts. comparable to those previously reported by other investigators. I. GREENWALD.

The influence of protein feeding on the elimination of creatine in starvation. W. C. ROSE. Univ. Penna., Univ. Texas. *Proc. Soc. Biol. Chem.; J. Biol. Chem.* 20, xix(1915).—In normal man, feeding large amts. of protein markedly diminishes the amt. of creatine eliminated in starvation. In severe cases of diabetes, as also in depancreatized dogs, this effect is lacking, indicating that the action of the protein is due to the carbohydrate arizing from it in metabolism. I. GREENWALD.

Osteitis deformans. J. CHALMERS DACOSTA, ELMER H. FUNK, OLAF BERGEIM AND PHILIP B. HAWK. Jefferson Medical College. *Publications Jefferson Med. College and Hosp.* 6, 1–44(1915).—A study of the metabolism in 2 cases of osteitis deformans (one early and one advanced) showed considerable retentions of Ca, Mg and P, with an approximate N balance and in the advanced case a marked loss of S. The urinary Ca excretions were very low. The findings are contrasted with those in osteomalacia where urinary Ca excretion is high and balance is strongly negative and are taken to indicate stimulated osseous or osteoid formation. OLAF BERGEIM.

Extra sugar during ether and nitrous oxide narcosis in fully phlorhizinized dogs. Sources of error in existing methods for the study of gluconeogenesis. W. D. SANSUM AND R. T. WOODYATT. Chicago. *Proc. Soc. Exp. Biol. Med.* 11, 157–9(1914).—It is pointed out that "extra" sugar is eliminated when phlorhizinized dogs are narcotized with Et_2O and N_2O. S. and W. conclude that this sugar finds its origin in glycogen, and further that in the study of gluconeogenesis in diabetic dogs (especially when the substances administered are chem. active or possessed of pharmacodynamic properties, which is the case with short chain aldehydes, ketones, keto acids, etc.) the appearance of "extra" sugar in the urine affords no proof that the substance itself has been converted into glucose or that any new sugar has been formed from any other

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source (such as fat), unless suitable methods have been employed to eliminate the glycogen. Cf. *C. A.* 9, 1937. V. C. MYERS.

The influence of induced diabetes on malignant tumors (including a report of a case of human phlorhizin glucosuria). S. R. BENEDICT AND R. C. LEWIS. New York. *Proc. Soc. Exp. Biol. Med.* 11, 134–6(1914).—As a development of the idea that utilization of glucose plays an important role in the synthesis of new protoplasm, B. and L. carried out expts. upon about 40 rats planted with the "Buffalo sarcoma" in which the animals were placed upon a carbohydrate-free diet, and at the same time rendered diabetic through the injection of 0.2 g. doses of phlorhizin in olive oil once in 2–3 days. It was found that the production of complete diabetes in exptl. sarcoma rats was followed by retrogression and ultimate cure of the growth in every case where the growth at the time of beginning of the treatment did not exceed 20 by 30 mm., and the animal could survive the treatment for at least 10 days. The urine picture in human phlorhizin diabetes exactly duplicates in all essential features the urinary findings in the later stages of severe types of diabetes mellitus. V. C. MYERS.

Physiological importance of certain previously unknown food constituents, the vitamines. CASIMIR FUNK. London. *Ergebnisse Physiol.* 13, 125–205(1913).—A discussion of vitamines, their occurrence and prepn., their relation to beriberi and to the diseases of the scorbutus group including scurvy, ship-beriberi, and Barlow's disease, their relation to growth, to cancer, their possible relation to pellagra and rickets, and their relation to nutrition and metabolism. JOSEPH S. HEPBURN.

Metabolism studies in a case of diabetes insipidus in a four-year-old boy. J. ROSENBLOOM AND H. T. PRICE. Pittsburgh. *Proc. Soc. Exp. Biol. Med.* 12, 20 (1914).—In some respects the condition seemed to be due to a defect of the kidney making it unable to secrete a concd. urine. V. C. MYERS.

A case of diabetes mellitus complicated by alimentary pentosuria and occasional lactosuria. J. ROSENBLOOM. Pittsburgh. *Proc. Soc. Exp. Biol. Med.* 12, 20(1914). —R. reports a case of diabetes mellitus in an adult with low tolerance for pentose and lactose. V. C. MYERS.

The influence of feeding upon acidosis in the phlorhizinized dog. S. R. BENEDICT AND E. OSTENBERG. New York. *Proc. Soc. Exp. Biol. Med.* 12, 45(1914).—In 5 expts. the authors found a drop of from 50 to 90% in the quantity of acetone and hydroxybutyric acid elimination, following the ingestion of moderate amts. of protein. A detn. of the G-N ratio in the urine showed that the fall in acidosis could not be ascribed to sugar burned in the organism. Caution should, therefore, be used in interpreting results of acidosis studies upon phlorhizinized animals. V. C. MYERS.

Observations upon the so-called food intoxication of infants with special reference to the alveolar air. J. HOWLAND AND W. MCK. MARRIOTT. Baltimore. *Proc. Soc. Exp. Biol. Med.* 12, 51–4(1914).—The authors have found with children who are nearly normal the CO_2 tension of the alveolar air with the Plesh method corresponds very well with that of the normal adult, the extreme limits for the CO_2 being 38–45 mm., with the great majority falling between 39 and 42 mm. In contradistinction to the regularity with normal patients are the results with those suffering with "intoxication." The CO_2 is almost always low, the highest being 33 mm., while in one case it was 18 mm. Associated with the low pressure there is almost always dyspnea. When alkali is given in large doses and absorbed there is a rapid rise in CO_2 tension, in several instances to a point much above normal (up to 59 mm. in one case). V. C. MYERS.

Honey in diet for diabetics. A. Y. DAVIDOV. *Russ. Vratch* 14, No. 26(1915); *J. Am. Med. Assoc.* 65, 1412.—From a study of 7 cases D. claims that honey is a good substitute for other sweet foodstuffs in diabetes. It prevents acetonemia and dimin-

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ishes the amt. of sugar in the urine in spite of the fact that honey contains 75% sugar.
L. W. RIGGS.

Variations in factors associated with acidity of human urine during a seven-day fast and during the subsequent non-protein and normal feeding periods. F. D. ZEMAN, JEROME KOHN AND PAUL E. HOWE. Columbia Univ. *Proc. Soc. Biol. Chem.; J. Biol. Chem.* **20**, xxvi(1915):—In the absence of exogenous P (fasting) it was found that the acidity (true and titratable), phosphates, Me_2CO, $AcCH_2COOH$ and total N vary together. During the non-protein post-fasting period there was an increased H^+ ion concn. and acidity without an accompanying increase in the N excretion; Me_2CO and $AcCH_2COOH$ were absent. The increased excretion of NH_3 in fasting is correlated with that of β-hydroxybutyric acid; when not influenced by this factor, as in the preliminary, non-protein, and final feeding periods, the NH_3 excretion fluctuated with the H^+ ion concn. and the acidity. The low NH_3 excretion in the final period showed that the low H^+ ion concn. and titratable acidity result from a loss of fixed base.
I. GREENWALD.

The nitrogen-sparing action of ammonium salts and urea. E. GRAFE. Heidelburg. *Deut. Arch. klin. Med.* 117, 448–61(1915).—It has been previously shown by the author and other investigators that for dogs and swine on a carbohydrate diet, NH_3 salts and urea have a N-sparing action. In this paper it is shown that the same holds true for man. Five patients who had no disturbance of the lungs, circulatory organs, digestive tract, or urogenital system, were given a carbohydrate diet containing a minimal amt. of N for a previous period of 5 days. Analysis of urine and feces showed a negative balance of N, *i. e.*, more N was excreted than ingested. For a period of 4 days, the same diet together with different amts. of NH_4Cl, NH_4 citrate, or urea was given. During this period the negativity of the N balance was decreased, and in some cases it became positive. In an after-period in which the carbohydrate alone was given, the N balance was again made more negative but not as much as during the fore-period.
JULIAN H. LEWIS.

The specific dynamic action of levulose, glycocoll and alanine in phlorhizin glucosuria. GRAHAM LUSK. New York. *Proc. Soc. Exp. Biol. Med.* 11, 168–9 (1914).—Ingestion of levulose by a dog which has been phlorhizinized does not increase the metabolism; the respiratory quotient is not changed and levulose is converted into dextrose, for this alone appears in the urine and in increased quantity. Ingestion of glycocoll or alanine largely increases the metabolism in glucosuria, although they are not oxidized and are converted into glucose and urea. The conclusion is drawn that the preliminary cleavage products of carbohydrate breakdown are not stimulants of metabolism, but that the increased heat production following carbohydrate ingestion is due to the mass action of sugar molecules. On the contrary, amino acids or the hydroxy- or keto- acids produced from them act as stimuli upon the cells, thereby increasing the heat production.
V. C. MYERS.

Phosphaturia. L. DÜNNER. *Deut. med. Wochschr.* 41, 973–6(1915).—In a case of polyneuritis the CaO of the urine was detd. and found high while the disease lasted, being 0.9 g. With improvement the Ca content of the urine dropped finally to between 0.35 and 0.4 g. CaO. Five days after 0.4013 CaO was found the patient received daily for 4 days 10 g. Ca lactate, the av. excretion per day being 0.437 g. CaO, and in a 4-day after-period 0.446. The diet was the same throughout.
S. AMBERG.

Alkaptonuria, cystinuria and diaminuria. M. W. SCHELTEMA. *Chem. Weekblad* 11, 692–705(1914).—A general discussion with many references to the medical and chemical literature.
J. T. FLOHIL.

Use of blood for bread (HOFMEISTER) 12.

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BENEDICT, F. G. AND MURSCHHAUSER, H.: **Energy Transformation during Horizontal Walking.** Washington, D. C.: Carnegie Inst. 100 pp. $1.00.

F. PHYSIOLOGY.

ANDREW HUNTER.

The secretion of gastric juice in man. A. J. CARLSON. *Am. J. Physiol.* 37, 50–73(1915).—Gastric juice unmixed with food was collected from a gastric fistula case with complete esophageal stenosis. Gastric juice is secreted continuously at a rate of 2 to 50 cc. per hr. Acidity of the contents of the empty stomach is low, 0.05 to 0.2%. The act of chewing or the presence in the mouth of inert substances not related to food does not stimulate the gastric glands. Seeing, smelling or thinking of food produces a relatively slight and inconst. secretion. Tasting and chewing palatable food produces an av. flow of 70 cc. of gastric juice in 20 min. In general the more palatable foods yielded the greater secretion. The latent period appears to be shorter than has been reported by others, and to vary according to the condition of the gastric cells. J. F. LYMAN.

The relation of the adrenals to the pancreas. F. C. MANN AND DELLA DRIPS. Mayo Clinic, Rochester, Minn. *Arch. Intern. Med.* 16, 681–92(1915).—The characteristic pink color of the pancreas, the increased flow of pancreatic juice and the decreased zymogen content of the pancreas after double adrenalectomy are apparently secondary to the changes in temp., blood-pressure, etc., induced by the procedure. "We have been unable to demonstrate any sp. relationship between the adrenals and the pancreas." I. GREENWALD.

Alveolar air analyses. I. Variations in the efficiency of the respiratory center, especially in sleep. H. STRAUB. Munich. *Deut. Arch. klin. Med.* 117, 307–417 (1915).—With verifications of previous writers, the irritability of the respiratory center, measured by the CO_2 tension of the alveolar air after the method of Haldane, was found to vary during the year. The amt. of variation varies in different people, being rather marked in some individuals and absent in others. There was a decrease in the CO_2 tension in 2 people upon going into a sub-Alpine climate. This change was not proportionate to the change in the barometer readings. In a condition of fatigue at evenings and in a half-awake condition on being aroused at night, the CO_2 tension of arterial and venous blood is increased. These facts, indicating an increased H-ion concn. during sleep, may explain the accompanying physical symptoms of sleep. **II. The change in the regulation of respiration through psychic and pharmacologic influences.** K. BECKMANN. Munich. *Ibid* 418–437.—The CO_2 tension of alveolar air is decreased under the influence of certain psychical conditions. This is perhaps due to the increased sensitiveness of the respiratory center to physiological stimulation In a case of hysterical tachypnea, there was no change in the CO_2 tension. The decrease of CO_2 tension of alveolar air must indicate a decrease of H-ion concn. in the whole body, and consequently numerous organs are affected. Certain pharmacologic agents influence the sensitiveness of the respiratory center to physiological stimulation The use of cola pastilles causes a decrease of CO_2 tension. In fatigue, alc. increases the CO_2 tension. Veronal produces an increase which reaches its height in about 1 hr. Later there is a marked decrease. Morphine increases it slowly but more markedly In cases of veronal and morphine poisoning there was also an increase. **III. The daily variations of the carbon dioxide tension and their causes.** H. ERDT. Munich. *Ibid* 497–516.—The CO_2 tension curve of arterial blood, measured by the analysis of alveolar air after the method of Haldane, shows regular variations during the day. The curve gradually rizes during the forenoon and reaches a max. during the late morning hrs. About noon it sinks slightly and in the afternoon it rizes again to a 2nd max. which remains in the form of a plateau. A second marked sinking occurs in the late

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afternoon followed by a 3rd rise in the evening. Just after breakfast the curve is at the lowest point of the whole day. The variation during the whole day for a single person seldom exceeds 2 mm. The increase in CO_2 tension during the day is caused by the digestive processes following a meal which bring about a displacement of the acidity of the blood by the secretion of digestive juices. On a carbohydrate-free diet, the CO_2 tension curve takes the regular form; but the periodic sinkings are more marked. The ingestion of a rich alk. diet in the form of vegetables causes the CO_2 tension to rize higher which returns to normal as soon as the alkalies are excreted. The effects of a carbohydrate-free meal last longer than the alkalies, because the acids formed under the influence of the former are excreted more slowly than the alkalies. Usually the variations in the CO_2 tension of venous blood follow those of the arterial. On some days the difference between the 2 varies considerably. The variations in the venous blood must affect the CO_2 tension in the various organs and, consequently, their function. **IV. The gas metabolism of active muscles in man.** M. METTENLEITER. Munich. *Ibid* 517–39.—By means of the analysis of alveolar air, estimates of the CO_2 tension and the amt. of acid formation in active human muscles are made. After a single and short exercize of a single large group of muscles there is a marked increase in the CO_2 tension of the blood, more marked in venous than arterial. The highest amt. in arterial blood was about 80 mm. After the cessation of work the CO_2 tension of arterial blood drops below normal. The max. fall was in about 10–20 min. This indicates that after muscular work there is an output of sarcolactic acid into the blood. The largest drop in the CO_2 tension of arterial blood corresponded to a concn. of about 0.07% sarcolactic acid in the blood. For a long time after cessation of work, the difference between the venous and arterial blood is great, indicating that the CO_2 in the muscles and the excretion of acid continue for a long while after the work is stopped. On a carbohydrate-free diet the drop in the CO_2 tension of arterial blood is more marked and lasting after muscular exercize than on a mixed diet. This indicates a still longer maintained increased excretion and formation of CO_2. After very severe muscular work, as after athletic events, the CO_2 tension of venous blood is abnormally low for several days. There is also a slight long-lasting acidosis. On a rich sugar diet, a single muscular exercize lasting for several hrs. also causes a slight acidosis. JULIAN H. LEWIS.

Does fat formation occur in the perfused kidney? FRANK P. UNDERHILL AND BYRON M. HENDRIX. Yale Univ. *J. Biol. Chem.* **22**, 471–5(1915).—Kidneys perfused for 24 hrs. with Ringer soln. may show an apparent increase in percentile and a smaller increase in the absolute amt. of fat in the cortex or in the entire kidney. U. and H. do not believe that this indicates a formation of fat from protein in surviving kidney cells since the same effect can be observed in a kidney merely suspended in Ringer soln. They believe that the effect is due to a washing out of material from the kidney and also to unavoidable contamination of the tissue to be analyzed with fat from the pelvis of the kidney. Cf. *C. A.* **9**, 657. I. GREENWALD.

The effect of pituitary substance on the egg production of the domestic fowl. LEWIS NEILSON CLARK. Port Hope, Ont. *J. Biol. Chem.* **22**, 485–91(1915); cf. *C. A.* **9**, 1932.—"These expts. show that: (1) Feeding of pituitary gland substance (anterior lobe) increased the egg production of hens whose egg production curve was on the decline: Case 1, with 35 hens in isolated pens; case 2, with 655 hens. 2. The dosage was effective on the fourth day after the first dose and existed for several days after the last dose. 3. The hatchability of eggs from dosed parents was increased." I. GREENWALD.

Quantitative studies of the in vivo absorption of iodine by dog's thyroid. DAVID MARINE. Western Reserve Univ. *J. Biol. Chem.* **22**, 547–50(1915).—The I of KI

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administered *per os* to dogs from which 1 lobe of the thyroid has been removed is to a very large extent (5.6 to 18.5%) stored in the thyroid. This tissue rapidly takes up I to its satn. limit, 5 to 6 mg. per g. of dried thyroid. The livers and spleens of the same dogs are free from I. I. GREENWALD.

Diuresis—the pituitary factor. DOUGLAS COW. *J. Physiol.* 49, 441–51(1915); cf. *C. A.* 8, 2899.—When cats' kidneys are perfused *in situ* with Ringer's soln. there is a decrease in urine secretion and rate of flow of perfusion fluid. Perfusion (1) with Ringer's soln. previously perfused through the general circulation of an eviscerated or intact animal, (2) with an ext. of intestinal mucosa in Ringer's soln. or (3) with the above ext. previously perfused through the circulation of the neck or hind limb had no effect on urine secretion. However with Ringer's ext. of intestinal mucosa previously perfused through the general circulation or through the head and neck circulation or to which ext. of pituitary gland had been added an increased urine flow and rate of flow of perfusion fluid resulted. The diuresis following the injection of saline exts. of intestinal mucosa is therefore dependent on the activity of the pituitary gland which is stimulated by these exts. and independent of the salt. J. F. LYMAN.

Action of secretin on the secretion of milk. A. L. I. MAXWELL AND A. C. H. ROTHERA. Univ. Melbourne. *J. Physiol.* 49, 483–91(1915).—Pituitrin causes a true secretion in the mammary gland of the lactating animal. This conclusion is based (1) on milking observations, (2) maintained rise of milk pressure in the udder after injections of pituitrin, and (3) comparison of the milk obtained by suckling kittens with the amt. of preformed milk in the mammary tissue of the mother. J. F. LYMAN.

The chemistry and physiology of the saliva. EDWARD C. KIRK. Phila., Pa. *Dental Cosmos* 57, 33–43(1915).—A report on the researches of various American investigators 1909–1914. JOSEPH S. HEPBURN.

Studies of internal secretions in their relation to the development and condition of the teeth. I. Effects of thyro-parathyroidectomy and thymectomy. WILLIAM J. GIES, SERGIUS MORGULIS AND WILLIAM A. PERLZWEIG. Columbia Univ. *Trans. Dental Soc. of State of New York* 1914, 105–31; *Dental Cosmos* 57, 276–300(1915).—Detns. of Ca content of the teeth and of bones (previously pulverized and dried to const. wt. at 100–110°) of thyro-parathyroidectomized albino rats and of controls were inconclusive regarding the decalcifying effect of parathyroidectomy. Chem. and histological studies of the teeth and bones of thymectomized albino rats failed to show that calcification processes were in any way affected by removal of the thymus. JOSEPH S. HEPBURN.

Results of the medical Röntgen procedure in relation to physiology. HANS DIETLEN. Strassburg. *Ergebnisse Physiol.* 13, 47–95(1913).—A review, describing the results obtained by various investigators who have applied the X-rays and Bi taken *per os* in the study of: the empty stomach, the unfolding of the stomach, the shape of the full stomach, the position of the stomach, the emptying of the stomach and the time required for emptying, gastric peristalsis and its functional significance, and gastric secretion. JOSEPH S. HEPBURN.

The regulation of breathing in man. C. GORDON DOUGLAS. Oxford. *Ergebnisse Physiol.* 14, 338–430(1914).—Of biochemical interest are the chapters on: effect of lack of oxygen upon breathing during rest, the exchange of gases between alveolar air and the blood, several factors which influence the power of the blood to contain gases, the velocity of the gas transport through the circulation. J. S. H.

Concerning the doctrine of the functions of the kidneys. W. LINDEMANN. Kiev. *Ergebnisse Physiol.* 14, 618–56(1914).—The kidney excretes the end products of metabolism and foreign substances, acts as the chief regulator of the osmotic equil.

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of the organism, tends to maintain the alkalinity of the blood, functions as an organ of internal secretion, and also produces hormones. The excretory function is discussed in detail. JOSEPH S. HEPBURN.

Effect of work on the percentage of hemoglobin and number of red corpuscles in the blood. W. M. BOOTHBY AND F. B. BERRY. *Am. J. Physiol.* 37, 378–82(1915). —There is an increase in % of hemoglobin and in the number of red blood corpuscles per cc. during work periods provided an appreciable amt. of perspiration is produced. J. F. LYMAN.

Determination of circulation rate in man at rest and at work. W. M. BOOTHBY. *Am. J. Physiol.* 37, 383–417(1915).—Circulation rate was calcd. from the data: amt. N_2O absorbed from the lungs, % N_2O in the lungs, absorption coeff. of N_2O, and time for absorption. Circulation rate increases proportionally with O consumption, corresponding to the increase in lung ventilation. Circulation rate is controlled mainly by the H^+ conc. of the blood; an increase of 3.3 l. per min. (doubling of circulation rate) is caused by a rise in total acidity of the blood corresponding to 2.0 mm. of CO_2 or a rise in H^+ conc. of about 0.013×10^{-7}. J. F. LYMAN.

Active principles of different organs, as shown in kymograph tracings. G. G. FAWCETT, JOHN ROGERS, JESSIE M. RAHE AND S. P. BEEBE. *Am. J. Physiol.* 37, 453–61(1915).—H_2O exts. of various glands were freed from nucleoproteins, globulins and coagulable proteins and the filtrate evapd. to dryness. This dry material is the only part of the H_2O ext. of thyroid, thymus, pancreas and liver which contains demonstrably active depressor agents, the depressor effect varying directly with the N content of the dry residue. The depressor substance cannot be choline since amts. of pure choline comparable to that of the thyroid residue produce no effect; neither does it appear to be the same as Popielski's vasodilatin. J. F. LYMAN.

Effect of blood flow upon iodine content of the thyroid gland. C. F. WATTS. *Am. J. Physiol.* 38, 356–68(1915).—Stimulation of the cervical sympathetic nerve or the thyroid nerves induces vaso-constriction in the thyroid and a decrease in I and H_2O content of the gland. Decrease in blood flow produced by mechanical means induced similar changes in the gland. J. F. LYMAN.

Experimental glucosuria. IX. Level of blood sugar in the dog under laboratory conditions. J. J. R. MACLEOD AND R. G. PEARCE. Western Reserve Med. School. *Am. J. Physiol.* 38, 415–24(1915).—Considerable variation may occur in the dextrose content of dog blood during anesthesia. These changes may be sudden, *e. g.*, from 0.140 to 0.160% in 2 min.; or gradual, *e. g.*, from 0.165 to 0.123% in 30 min. In general a direct relationship exists between glycogen content of the liver and the dextrose content of the blood. Samples of portal and vena cava blood taken simultaneously agree closely in dextrose content. Changes occurring in blood dextrose in 10 min. in anesthetized dogs are small compared with those observed in blood similarly removed from animals in which the splanchnic or hepatic nerves were stimulated. **X. Sugar-retaining power of the liver in relationship to the amount of glycogen already present in the organ.** *Ibid* 424–37.—Comparison of dextrose content in portal and vena cava blood after injection of dextrose into the portal blood of fasted and well fed animals indicates that glycogen-poor livers have no greater avidity for dextrose than do glycogen-rich organs. J. F. LYMAN.

Secretion of bile. S. OKADA. Univ. Coll., London. *J. Physiol.* 49, 457–82 (1915).—Flow of bile in dogs is increased markedly by Na salicylate and chloral hydrate, moderately by cream of tartar and alc. in large doses, slightly by salol and pilocarpine. Calomel is without effect, while atropine causes a slight decrease. Boiled egg white, fat or oil, soap soln., acids, Witte's peptone, Liebig's ext. of meat, bile salts

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or bile when introduced into the stomach cause an increased flow, while sucrose, cakes of starch and sugar, H_2O, solns. of $NaHCO_3$ have little or no effect. Secretin or Witte's peptone injected intravenously accelerate the production of bile. J. F. L.

The effect of the pituitary on the isolated human uterus. C. C. Lieb. New York. *Proc. Soc. Exp. Biol. Med.* 12, 8–10(1914).—The contractions of the parturient tube and uterus were invariably increased in rate and strength when exts. of the pituitary gland were applied. The effect on the non-pregnant tube or uterus is wholly different. An expt. in a case of tubal pregnancy appeared to indicate that 6 weeks after conception pituitary may have a stimulating effect. Since the anterior portion of the pituitary hypertrophies during pregnancy, interest centers in this portion of the gland.
V. C. Myers.

Note on action of corpus luteum upon the mammary glands. I. Ott and J. C. Scott. Phila. *Proc. Soc. Exp. Biol. Med.* 12, 47(1914).—Virgin rabbits were injected with aq. exts. of the corpora lutea of the cow, every 3 days for a month. The mammary glands were found to be much enlarged and showed microscopically a ten-fold increase in the number of glands compared with the occasional ones in the virgin rabbit.
V. C. Myers.

Increase in the milk secretion of cows under the influence of subcutaneous injections of carbohydrates. R. Ricci and A. D'Amato. *Agric. ital.* 10, 609–16(1914); *Bull. Agr. Intelligence* 6, 107(1915).—A continuation of the studies of Lomonaco and of Nazari on the influence of sugar on milk secretion. Injections of 5 cc. lactosecretin, a very strong soln. of sucrose, glucose, and galactose, were given daily for 3 weeks. A period of constant diet preceded the injection period. Observations were made on the milk yield, compn. of milk and yield in cheese. The av. daily milk yield, in lbs., was as follows: preliminary period (6 days), 14.67; exptl. period, 1st week 17.00, 2nd week 17.85, 3rd week 16.86. Analyses showed the milk to be fairly const. in compn. An increased fat content was noted on last day of the preliminary period and the 2nd and 4th days of injection, and an increased yield of cheese on the 2nd, 7th, and 10th days of injection. The authors conclude that, to produce an increased flow of milk and the associated improved quality of milk, 5 cc. of "zoölactosecretin" are required. More work is needed, on different animals, and of longer duration, to det. whether or not the effect is continuous or only temporary.
W. A. Perlzweig.

The specific heat of muscle protein and its significance for the heat of combustion. Otto Krummacher. *Z. Biol.* 65, 355–64(1915).—It was found that the sp. heat of muscle substance, washed and dried on H_2O-bath and *in vacuo*, is 0.265. For the fat-free substance it is 0.257. 100 g. of the protein requires 42.8 cal. for a rize of temp. of 1°.
W. A. Perlzweig.

Refractometric determination of albumin, globulin, and nonproteins in normal human blood serum. C. L. Tranter and A. H. Rowe. *J. Am. Med. Assoc.* 65, 1433–4(1915).—Applying the method of Robertson (*C. A.* 9, 2931) to the blood serum of 30 normal persons it was found that the total proteins range between 6.7 and 8.7, av. 7.94%; total albumins lie between 4.95 and 7.7, av. 6.2%; globulins between 1 and 2.54, av. 1.74%; and nonproteins between 0.98 and 1.19, av. 1.09%. The refractivity of the nonproteins varied from 0.00158 to 0.00190, av. 0.00175. Work in diseased conditions is to follow.
L. W. Riggs.

Chemical study of woman's milk, especially its inorganic constituents. L. E. Holt, *et al.* New York. *Am. J. Dis. Children* 10, No. 4(1915); *J. Am. Med. Assoc.* 65, 1485.—In the colostrum period protein and ash are high and fat low; in the transition period protein and ash are lower and fat higher; after one month the comp. does not essentially change to the end of lactation. Sugar should be placed at 7.5% instead

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of the generally accepted 7%. Protein of mature milk is seldom over 1.25%, of which one-third is casein and two-thirds lactalbumin. The high ash of the colostrum period is chiefly due to the amt. of Na_2O and K_2O. Of the constituents of the ash, Na_2O is most variable, and CaO least; K_2O is most abundant and with CaO makes up more than half of the ash. Ash of cow milk is about 3.5 times that of woman's milk, but the proportion of different salts present is nearly the same, the exceptions being that cow's milk contains more P_2O_5 and less Fe. L. W. RIGGS.

Neutralization of acid stomach and intestinal contents. A. M. ZAITZEV. *Russ. Vratch* **14**, No. 29(1915); *J. Am. Med. Assoc.* **65**, 1496.—From expts. on dogs Z. found that the acidity of the stomach and upper portion of the small intestine is neutralized by the pancreatic juice. In the lower portion this is accomplished by the intestinal juice and mucus. Cl in the stomach comes from the pancreatic juice, as the proportion of Cl increases in the stomach when acids not containing Cl are introduced. In the pyloric portion of the stomach the acidity is less than in the fungus, because of the presence of the pyloric alk. juice. After the introduction into the stomach of acid fluids the stomach content acquires the properties of tryptic digestion, showing that the pancreatic juice gets into the stomach under such conditions. L. W. RIGGS.

Differential effects of epinephrine on splanchnic and peripheral arteries. F. A. HARTMAN. Harvard. *Am. J. Physiol.* **38**, 438–55(1915).—Dil. epinephrine soln. (0.2 cc. of 1:100000 soln.) slowly injected into anesthetized cats caused a fall in general blood pressure in 48 out of 53 animals. In the 3 expts. tried the reversal in action of epinephrine from a fall in the peripheral vessels to a rise occurred when the soln. injected over a period of 10 to 30 seconds was from 0.1 to 0.3 cc. of 1:10000 soln. The same dose which caused dilation of the peripheral arteries caused constriction of the splanchnic arteries. Large doses of ergotoxine phosphate inhibit the splanchnic response to dil. epinephrine. The existence of sympathetic vasodilator nerves in the peripheral arteries and their absence in the splanchnic arteries would account for the opposed action of like doses of dil. epinephrine. J. F. LYMAN.

G. PATHOLOGY.

H. GIDEON WELLS.

Examination of tuberculous cerebrospinal fluid with ninhydrin. E. NOBEL. *Münch. med. Wochschr.* **62**, 975–7(1915).—One-half to one cc. cerebrospinal fluid is boiled 1/2 min. with 0.1 cc. 1% ninhydrin soln. If the soln. becomes blue the test is positive. The positive reaction is only partly due to the protein content of the fluid. The test proved of value in the differential diagnosis of tuberculous meningitis. S. AMBERG.

The disturbances of the circulation caused by "shock poisons." H. MAUTNER AND E. P. PICK. *Münch. med. Wochschr.* **62**, 1141–3(1915).—The results of expts. on animals with peptone and histamine are given, as well as those obtained on reinjection of antigen in the sensitized animal. The influence of these toxins on the circulation in intestines, liver and lungs was studied. The work on liver and lungs includes expts. with perfusion of the surviving organs. The "shock poisons" act as spasmodics on the smooth muscles. The methods employed and the expts. themselves are to be detailed elsewhere. S. AMBERG.

The theory of the Gruber-Widal reaction. STUBER. *Münch. med. Wochschr.* **62**, 1173–4(1915).—Bacteria killed by heat were digested with pepsin, then with trypsin. Shaking out with ether left a residue containing very little fatty substance. The fatty substances were purified by repeated soln. in Et_2O and petr. ether. In most instances the fats were solid (higher fatty acids). Thus far only the diphtheria bacillus has yielded fluid fats, perhaps unsatd. fatty acids. The fats were emulsified in 100 cc.

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saline soln. The amount of fat used was about 1 mg. The work was carried out with typhoid, diphtheria, tuberculosis bacilli and staphylococci. Animals received subcutaneously 1, 2, 4 and 6 cc. of this emulsion, while others received the residue, and still others digestion products not yet shaken out with ether, that is to say, residue and fat. The Gruber-Widal reaction was used to det. the agglutinins of the blood of the injected animals. The residue poor in fat leads to a very weak agglutinin formation or to none at all. The fat and the total ext. (residue and fat) gave strong agglutinins. The agglutinating power of the animals treated with typhoid bacilli fat was high (1:800–1:1600); that of the animals treated with the emulsions obtained from the other bacteria was very evident (1:320–1:600). The agglutinogens are regarded as fatty substances liberated in the destruction of the bacteria. The specificity of the Gruber-Widal reaction is limited. Nervous individuals with a negative reaction received 5 cc. 10% NaCl subcutaneously; 12 hrs. later it was possible to obtain an agglutination of typhoid bacilli (1:320). It is supposed that the agglutinogens lead to the formation of agglutinins by means of stimulation of the nervous system, probably the sympathetic. The injections of the emulsions in man produced sometimes an enormous increase in wt. The serum of rabbits made typhoid carriers give a reaction 1:320. It was extd. with ether. In this way the agglutinins were much diminished. The fat emulsion added to normal serum and incubated about 1 hr. conferred to the normal serum high agglutinating power. Intravenous injection of fat emulsion in rabbits with non-agglutinating serum, gave an agglutinating serum. S. AMBERG.

The formation of side agglutinins. FR. KUTSCHER. *Münch. med. Wochschr.* 62, 1213–4(1915).—The blood of persons vaccinated against typhoid fever and cholera has a high agglutinating power for dysentery bacillus Kruse, not for Flexner *y*, or paratyphoid bacilli. Test sera of animals immunized against typhoid and cholera bacilli gave the same result. S. AMBERG.

The antigen action of sensitized and non-sensitized blood cells, and typhoid bacteria. L. V. LIEBERMANN AND D. ACÉL. *Deut. med. Wochschr.* 41, 965–6(1915).—Rabbits were immunized with anti-sheep serum. Their serum was then tested for anti-amboceptors with sheep corpuscles and guinea-pig serum as complement. The serum had no anti-amboceptor property; indeed it proved of greater hemolytic power than normal serum. This increase in hemolytic power was shown to be due to the amboceptors contained in the immune serum. Rabbits were treated with various typhoid vaccines: (1) living typhoid bacilli, (2) bacilli sensitized according to Besredka, (3) bacilli killed with 1% phenol, (4) bacilli sensitized according to Ichikawa, (5) bacilli treated with normal rabbit serum, and (6) rabbit typhoid immune serum. The sera of the rabbits treated in these several ways were tested after 7, 17 and 37 days for their agglutinating and bactericidal power with typhoid bacilli. In further tests on 2 men one received vaccine of typhoid killed with phenol, the other vaccine sensitized according to Besredka. The results show that as far as the amt. of agglutinins and bactericidal anti-bodies in the blood is concerned there is no difference whether sensitized or non-sensitized vaccine is used. S. AMBERG.

Fat metabolism of the cell, tested with the "fat-partial" antigens of the tubercle bacillus. H. MUCH AND W. MUELLER. *Deut. med. Wochschr.* 41, 970–1(1915).—Treatment of tubercle bacilli with lactic acid yields partial antigens according to Deycke and Much. The tubercle bacilli residue contains all the solid partial antigens including the fats. The fatty part is divided in a fatty acid lipoid mixt. and one containing neutral fat and fatty alcohols (tuberculo-nastin). The fatty acid lipoid mixt. is acid-fast, due to the fatty acids present. The tuberculo-nastin does not stain with Ziehl or Gram-Much. On injection of tuberculo-nastin in the peritoneal cavity of the guinea pig, particularly after repeated injection, some cells, especially macrophages

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also swollen endothelial cells, more rarely white blood corpuscles, contain in their cytoplasm material staining with Ziehl as well as with Much. Other staining methods (as hematoxylin, eosin, van Gieson, Unna-Fraenkel elastic tissue, Unna plasma cell, methylene blue, Weigert fibrin, Pappenheim panoptic), are negative. The fatty acid lipoid mixt., itself *in vitro* acid-fast, when injected into the peritoneal cavity, loses this property. Of all the partial antigens only the tuberculo-nastin brings about this reaction, and it must be changed in the cell, since these acid- and Much-fast globules never occur outside the cells. In course of time these globules disappear again. Animals having received previously tb. protein or tb. residue give the reaction only very weakly, while previous treatment with the other partial antigens frequently increases the reaction. Previous treatment with other acid-fast bacteria (*Streptothrix Deycke*) is without influence. Rabbits give the same reaction, but only after repeated injections of relatively large amts. The cell inclusions disappear here much more rapidly. The reaction can also be observed in the monkey, but with some peculiarities. Expts. *in vitro* with white blood corpuscles or human bone marrow were negative. In place of the bacterial fat several other fatty substances, such as wax of human cadavers, stearin, palmitin, oleic acid, tristearin, tripalmitin, triolein, were used without result. S. AMBERG.

A case of diabetes insipidus treated successfully with "Hypophysin-Hoechst." G. GRAUL. *Deut. med. Wochschr.* 41, 1095–6(1915).—A patient with diabetes insipidus received every 2nd day 1 cc. "Hypophysin-Hoechst" in 1 per mille soln. intramuscularly; 16 injections altogether were given. Previously the patient was treated by giving him a diet poor in NaCl and protein with a limitation of the water intake to the absolutely necessary amt. As a result the daily urine output fell from 9500 cc. to 5000 cc. After starting the hypophysin treatment on the usual hospital diet, the urinary output fell to 2000 cc., with a rapid general improvement. Toward the end of the treatment the total N of the urine was found to be excessively low (on general diet). There existed an alimentary glucosuria. With hypophysin the water output was much diminished, but the sp. gr. remained constantly low (1.00–1.005). The effect of the treatment lasted as long as the patient was under observation, that is, 3 weeks after its cessation. S. AMBERG.

A study of respiration and circulation in picrotoxin convulsions. The possible bearing of this study on the theories of the pathogenesis of epileptic convulsions. LEWIS J. POLLOCK AND WILLIAM H. HOLMES. Northwestern Univ. Med. School. *Arch. Intern. Med.* 16, 213–22(1915).—A review of the literature on the action of picrotoxin and a summary of the results of the authors' work. The effects of the administration of picrotoxin may be observed in decerebrate dogs but, if the cord be cut below the medulla, only the parts of the body supplied from above the section participate. It is concluded that picrotoxin is a medullary convulsant. The effects produced by picrotoxin are considered to be sufficiently similar to the symptoms of epilepsy as to afford further evidence for the view that the site of the discharge of the convulsions in some types of idiopathic epilepsy is in the medulla and pons. I. GREENWALD.

The creatinine of the blood in nephritis. Its diagnostic value. VICTOR C. MYERS AND WALTER G. LOUGH. New York. *Arch. Intern. Med.* 16, 536–46(1915).—"The creatinine rizes above 2.5 mg. per 100 cc. of blood almost without exception only in conditions with renal involvement. Creatinine values from 2.5 to 3 mg. may be viewed with suspicion; figures from 3 to 5 mg. regarded as decidedly unfavorable, while over 5 mg. probably indicates an early fatal termination." The detn. is considered to be of great value in diagnosis and prognosis. I. GREENWALD.

Studies of nitrogen partition in the blood and spinal fluid with special reference to the possible causation of albuminuric retinitis. ALAN C. WOODS. Peter Bent Brigham Hosp., Boston. *Arch. Intern. Med.* 16, 577–86(1915).—Detns. were made of th

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total non-protein N (N. P. N.), NH_3-N, NH_2-N, urea, uric acid, creatinine (total and preformed) and Cl in the blood and of the N. P. N. and urea in the spinal fluid. W.'s conclusions are "There is no apparent relationship between the retention of any nitrogenous substance and the occurrence of albuminuric retinitis and there is certainly no evidence that they stand in the relationship of cause and effect. In the limited number of cases in the series (18), there seems to be a more than casual relationship between the "residual N" (difference between N. P. N. and sum of N of urea, NH_3, uric acid, total creatinine and NH_2-N) of the blood and the severity of the case as observed clinically. As the level of N. P. N. rizes, the component nitrogenous substances increase, and in the case of the chief constituents, the rise is proportional. Estimations of N. P. N. and of urea in the spinal fluid give no greater diagnostic or prognostic significance than the estimations of these substances in the blood. The variations in the Cl conc. in the blood are so small that in themselves they give no idea of salt retention." I. GREENWALD.

Studies on the relation of the hypersusceptibility and insusceptibility induced in guinea pigs by the installation of horse-serum into the nose. HENRY SEWALL AND CUTHBERT POWELL. *Arch. Intern. Med.* **16**, 605–31(1915); cf. *C. A.* **8**, 3201.—Guinea pigs were treated with from 2 to 5 instillations of horse serum into the nose at intervals of from 1 to 24 days. About half of the animals became sensitive to horse serum and the others were not at all susceptible. S. and P. were unable to det. the conditions responsible for these effects. The accepted theories of desensitization were not applicable. I. GREENWALD.

A study of the hemolytic activity of the spleen in pernicious anemia. OSWALD H. ROBERTSON. Mass. Gen. Hosp. *Arch. Intern. Med.* **16**, 652–6(1915).—Spleens removed from patients with pernicious anemia were extd. with 0.8% NaCl soln. or with EtOH. With or without the addition of guinea-pig complement, these extracts possessed no hemolytic properties either for the blood of the same or of other individuals. The only change in the blood of the splenic vein obtained at the operation which could not be accounted for by the operation was a decreased resistance of the red cells. These were definitely less resistant than those of the peripheral circulation in the same individual. I. GREENWALD.

The chemotactic action of secretions and tissue extracts. H. DOLD. Shanghai. *Deut. Arch. klin. Med.* **117**, 206–23(1915).—The sterile aq. exts. of tissues (muscle, lung, liver, kidney, adrenal, spleen, testicle, spinal cord) produced, in the same species of animal from which the tissues were taken or from another species, a leucocytosis when injected intravenously into rabbits or guinea pigs, and a local exudation of leucocytes when injected into the knee joint. The reactions produced by the exts. of glandular organs were slightly and irregularly stronger than those produced by the exts. of muscle. Bile and urine injected in the same way produced the same effects. The addition of homologous serum to the organs extd. did not increase their effects but did increase the effects of bile and urine. The authors believe that sterile traumatic inflammation is a reaction to the lymph flowing from the injured area. The action of bile and urine explains the leucocytosis in jaundice and uremia. The leucocytosis during digestion is a reaction to an increased flow of lymph from the digestive tract and the hypoleucocytosis of hunger is due to the decreased lymph flow. The leucocytosis in tumor cachexia comes from a reaction to the disintegrative products of the tumor tissue. JULIAN H. LEWIS.

Colloidal clay, kaolin and talc in dermatology. P. ROHLAND. Stuttgart *Kolloid-Z.* **17**, 44–6(1915).—The use of these materials in military therapy depends on their capacity for adsorbing H_2O or body fluids, odors, etc. The different clays and kaolins show great variations in this capacity and their efficiency should be tested by

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studying their adsorption of a dye soln. The adsorption of toxins is variable and unpredictable (Cf. Zunz, *C. A.* 8, 370). H. I. MATTILL.

Germicidal efficiency of dental cements. P. POETSCHKE. *J. Ind. Eng. Chem.* 7, 195–202(1915).—The antiseptic properties of various cements on the market were studied. A method is given for testing the germicidal power. ISADOR MILLER.

Absorption of iron from the organs after hemolysis. ROBERT MUIR AND JOHN S. DUNN. Univ. Glasgow. *J. Path. Bact.* 20, 41–9(1915); cf. *C. A.* 9, 1199.—After acute hemolytic anemia in rabbits the excess of Fe which has been stored in the organs has been nearly all absorbed by the time of complete regeneration of the blood, and has been presumably utilized for the purpose of blood formation. The absorption is most complete from the liver cells; it is less complete, a certain excess remaining, in the endothelium of the liver capillaries, in the pulp of the spleen, and especially in the cortex of the kidneys. JOHN T. MYERS.

A quantitative application of the Abderhalden serum test. D. D. VAN SLYKE AND M. VINOGRAD. Rockefeller Hospital. *Proc. Soc. Exp. Biol. Med.* 11, 154(1914). —A modification of the Abderhalden reaction is described in which the HNO_2 method is employed to detect proteolysis and the test thus greatly simplified, made quant. and its sensitiveness increased 30 times compared with the dialysis method. Negative results were obtained, however, with the Rous chicken sarcomas, Nos. 1 and 2, even when the serum tested was from the chicken furnishing the tissue substrate. V. C. MYERS.

Variations in resistance of red cells in sheep. R. OTTENBERG AND J. G. HOPKINS. New York. *Proc. Soc. Exp. Biol. Med.* 11, 162–6(1914).—The red cells of individual sheep show marked variations to laking either by immune serum or by hypotonic salt soln. Resistances to laking by these 2 agencies are always parallel to each other. These differences are not due to acute hemorrhage. V. C. MYERS.

On the production of hyaline casts by certain ions. F. L. GATES AND S. J. MELTZER. Rockefeller Inst. *Proc. Soc. Exp. Biol. Med.* 11, 167–8(1914).—The injection of any compds. which have either Mg or the SO_4 radical causes the appearance of hyaline casts in the urine. There appears to be some definite relation between the diuretic action of the salts under discussion and their specific capacity for producing hyaline casts. V. C. MYERS.

The production of duodenal lesions and ulcers in dogs by injections of epinephrine and of gastric lesions and ulcers in rabbits by extirpation of the adrenals. G. A. FRIEDMAN. New York. *Proc. Soc. Exp. Biol. Med.* 11, 169–71(1914).—F. succeeded in a period of 1–2 weeks in producing duodenal lesions and ulcers in 8 dogs by daily subcutaneous and intravenous injections of epinephrine-HCl. Extirpation of the left adrenal in 5 rabbits produced erosions and ulcers at the pylorus in 3, erosion at the pylorus and ulcer in 1st portion of duodenum in 1, and no lesions in 1. Extirpation of the right adrenal produced erosions at the lesser curvature, proximal to the cardia in 3 rabbits, and a round ulcer at the posterior wall of the stomach in one. The most pronounced ulcers, reaching down to the serosa, were obtained at the fundus of the 10th rabbit after extirpation of $^2/_3$ of the right adrenal and 5 days later of the left. In 14 normal rabbits no lesions were seen in the stomach or duodenum. V. C. M.

Optical studies on the appearance of protective enzymes after the parenteral administration of peptone prepared from kidney tissue. E. BASSANI. *Fermentforschung* 1, 131–50(1914).—Peptone obtained from blood-free kidney tissue when injected in soln. subcutaneously into rabbits, was decomposed. The serum of these animals *in vitro* failed to digest, while the serum of human nephritic patients in some cases, did digest, the peptone. The serum of a rabbit under whose skin some kidney tissue

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was imbedded acquired the faculty of decomposing kidney-peptone and coagulated kidney tissue, but not other tissues. The optical method was employed along with the dialysis method. W. A. PERLZWEIG.

Presence in guinea-pig blood of natural anti-sheep hemolysin. H. N. COLE. *Cleveland Med. J.* 14, No. 4(1915); *J. Am. Med. Assoc.* 64, 1876.—The blood of the guinea pig occasionally contains a normal antisheep amboceptor which can be detected by control tubes A and B containing saline, 5% sheep red blood cells and 10% guinea-pig serum to be tested in suitable amts. If after incubation for 30 min. at 37.5°, these tubes show any hemolysis then a certain amt. of this immune body is present and unless removed will cause practically all of the serum to be tested to be returned negative to the Wassermann test. As complement is thermolabile and inactive at low temps., while amboceptor is thermostable and active at 0°. it is possible to get rid of the antisheep hemolysin, present in the guinea-pig serum, by mixing it with washed sheep red blood cells and allowing them to stand 1 hr. at 0°. After centrifuging the complement is then ready to be used for the reaction. As a means of lessening the action of this troublesome antibody, Cole advises the use of the pooled serum of several pigs. L. W. RIGGS.

Use of alkalies and salts in certain clinical conditions of apparently obscure origin. ARTHUR R. DUNN. *N. Y. Med. J.* 102, 396–8(1915).—Presence of lactic acid throughout the body, following injury to the protoplasm, causes swelling of the body colloids. This explains why cerebral edema follows injury to the head, and why edema of the brain and body organs is found after death from acute infections. Diuresis following use of saline cathartics is the result of dehydration of the swelled colloids. D. used $NaHCO_3$, Na_2CO_3, milk of magnesia, $MgSO_4$, NaCl, MgO, and magnesium citrate in the treatment of acidosis and edema. A. H. RAHE.

Dust in mine air and the causation of miners' phthisis. JAMES MOIR. *J. Chem. Met. Soc. S. Africa* 16, 1–8(1915).—A report of a committee is made concerning the size, number and other properties of particles of SiO_2 dust as found in mine air. A particle of 1 micron diam. falls at the rate of 0.0075 cm. per sec. and requires 5.5 hrs. to fall a distance of 5 ft. Assuming a standard shape (that of a rounded tetrahedron) and then knowing the vol. and d. of the particle it is found that there are approx. 1,200,000 particles to the mg. for a quartz particle 10 microns in diam. The air was collected in sugar tubes and a 16% sugar soln. used to catch the dust. After standing for a definite time, the very fine particles (under 12 microns) are filtered off and detd. gravimetrically. The soln. is then filtered through a 260-mesh screen to remove all particles over 50 microns in diameter, and it is then allowed to stand at 40° for 4 min. and the upper liquid removed by a siphon. The sediment is mixed with H_2O to its original vol. and allowed to stand 2 min. and then siphoned off. This sediment consists of particles larger than 12 microns and less than 50 microns and can be filtered off and weighed, while the 2 liquids siphoned off are united and filtered and the weight of the very fine dust obtained. The amts. of gases in a mine 30 min. after blasting with a water blast in use, showed from 63 samples, an av. of 0.316% CO_2 and 0.028% CO. Ten samples from a completely unventilated mine showed 30 min. after blasting, 1.046% CO_2 and 0.12% CO. R. L. SIBLEY.

Study of anti-diphtheric serum. V. BABES. *Bull. acad. sci. roumanie* 2, 107–16(1913–4); *Chem. Zentr.* 1915, I, 1135.—The studies show that the treatment of diphtheria depends not so much upon the abs. amt. of antitoxin injected, as upon the degree of diln. The objection that the tricresol used with the serum has a toxic effect is untenable. B. concludes, contrary to Bering, that the duration of immunity is about 6 months. F. W. SMITHER.

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Action of cholera and typhoid antitoxin on the suprarenal cells. C. A. DEMETRESCU. *Bull. acad. sci. roumanie* 3, 225–7(1914–5); *Chem. Zentr.* 1915, I, 1175. —Cholera endotoxin destroys the normal color reactions of the coloring substance of suprarenal cells. Suprarenal cell ext. of animals inoculated with an emulsion of cholera vibriones contains practically no epinephrine, as there is almost no rise of arterial pressure, the Ermann-Meltzer reaction on the frog pupil is not given, and no characteristic color reaction is given with phosphomolybdic acid. Typhoid endotoxin has practically no effect on the coloring substance of suprarenal cells. F. W. SMITHER.

The pathology and etiology of pyorrhea alveolaris. PERCY R. HOWE. Boston, Mass. *Dental Cosmos* 57, 307–13(1915).—A discussion of the bacterial relationship of the disease, and of the biochemistry of the formation of the calcareous deposits. H. reports the occurrence, in the deposits, of neutral fats, and phosphorized fats and soaps, their quantity diminishing as calcification proceeds. The presence of fat was demonstrated by extn. of soft deposits with ether; lecithin by the presence in this ext. of a substance insol. in acetone; soaps by the treatment of the residue from the above extn. with hot acid alc. Micro-staining methods were also used. "By the use of pyrogallic acid the calcification may be seen to be proceeding in definite and detached areas. The phosphates may be seen by staining with $AgNO_3$." Sudan III and scarlet R were used for fatty acids and neutral fats. The presence of a very considerable amt. of lecithin in the saliva of pyorrhea alveolaris cases is reported, and is stated to have a probable connection with the calcification. JOSEPH S. HEPBURN.

Rationale of the use of bacterial vaccines in pyorrhea alveolaris. A. PARKER HITCHENS. Glenolden, Pa. *Dental Cosmos* 57, 1–7(1915).—A discussion of immunity and of vaccine therapy with special reference to the treatment of pyorrhea alveolaris. The technique for the prepn. of the autogenous vaccine is given in detail. J. S. H.

Concerning the production of dental caries. ARTHUR HOPEWELL-SMITH. Univ. Penna. *Dental Cosmos* 57, 990–1002(1915).—Pepper, fruit juices, starch and candies, except those containing a proportion of flavoring element such as vegetable or inorganic acid, and especially those of a sticky character, are bacteriophile toward the caries-producing bacteria. Mustard, vinegar, coffee, acidulated candies, glucose, and perhaps sucrose, are bacteriophobe toward these organisms. The intact enamel cuticle is a potent factor in the prevention of caries; the *loci principii* of caries are detd. by the penetration of bacterial masses beneath its abraded edges. Expts. on factors influencing the reaction of the saliva are reported. Expts. *in vitro* demonstrated that "superficial changes in the enamel leading to decalcification of that tissue can be set up by such sweetmeats as chocolate and 'caramel' in the presence of very acid saliva, from the mouth of an immune as well as from the mouth of a non-immune." J. S. H.

Neuralgia. D. H. SQUIRE. Buffalo. *Dental Cosmos* 57, 611–5(1915).—Erosion, abrasion, caries, the presence of a metal crown or of a large metallic filling may cause mild irritation of the dental pulp. Crowns and fillings irritate since they are good conductors of thermal changes and electricity. The irritation gives rise to tubular calcification, formation of secondary dentine and of calcific pulp nodules, and to calcareous degeneration of the pulp. These changes produce neuralgia; the sensory and vaso-motor nerves of the pulp become stimulated, then over-stimulated, irritated, and finally paralyzed. JOSEPH S. HEPBURN.

Bacteria of the mouth and their relation to systemic disease. F. E. STEWART. Medico-Chirurgical College, Phila., Pa. *Dental Cosmos* 57, 61–9(1915).—A review from the viewpoint of bacteriology and immunity. JOSEPH S. HEPBURN.

Experimental edema in frogs. A. R. MOORE. *Am. J. Physiol.* 37, 220–9(1915). —Simple factors, H_2O absorption by osmosis, transudation and interference with

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draining power of the lymphatics and veins, are sufficient to account for the phenomena of exptl. edemas in frogs; therefore further hypotheses are unnecessary. J. F. L.

The anaphylactic response of the human fallopian tube. R. Weil. New York. *Proc. Soc. Exp. Biol. Med.* 12, 75–6(1915).—Fallopian tubes which came from sensitized individuals presented a distinct response upon the addition of minute amts. of horse serum, while controls failed to respond even on the addition of large amts. of horse serum. The contractile response, although much less pronounced than in the case of the guinea pig, is still unmistakable. The response to ergamine, epinephrine, and other similar drugs, is also very much less marked, in the case of the human prepn. From an anaphylactic standpoint, the human smooth muscle is intermediate between that of the guinea pig and that of the rabbit. This fact explains the character of the anaphylactic symptoms which have been obtained in human beings. V. C. Myers.

Physical analysis of blood serum in nephropathies and cardiopathies. E. E. Butterfield and W. H. Braddock. Bellevue Hospital. *Proc. Soc. Exp. Biol. Med.* 12, 73–5(1915).—B. and B. describe a system of physical analysis of the blood serum, which yielded valuable information as to the relative concn. of chem. substances possessing similar physical properties. The f. p., n and the sp. gr. of the blood serum are independent variables within certain limits. Systematic use of these methods on 50 cases, chiefly nephritics, cardiacs, and arteriosclerotics, has shown that definite serum pictures exist which are more or less characteristic of different types of nephritis or cardiac disease. Nephritic edema is associated with hydremia while in cardiac edema the blood serum is normal. Uremia may or may not be associated with hydremia. When hydremia and uremia coëxist subcutaneous edema is also present. The arteriosclerotic cases with hypertension and with indefinite renal or cardiac symptoms show an extremely concd. serum without any elevation in f. p. V. C. Myers.

Studies on so-called protective ferments. II. Proteolytic enzyme is not specific. J. Bronfenbrenner. Pittsburgh. *Proc. Soc. Exp. Biol. Med.* 12, 3–4(1914).—The Abderhalden reaction appears to be composed of 2 phases; the one (specific) the sensitization of placenta; the other (non-specific) the autodigestion of the serum as a result of the presence of sensitized placenta. The assumption of specific proteolytic enzymes thus becomes unnecessary. **III. The Abderhalden reaction is not an adsorption phenomenon.** *Ibid* 4–5.—The fact that the appearance of dialyzable substances can be brought about in male serum by placenta, if the placenta was previously sensitized, has led B. to the conclusion that it is the union between the placenta and some part of the pregnant serum, which union is very similar to that of antigen and antibody, that brings about changes in the placenta which enable such placenta to cause autodigestion of any fresh serum. **IV. The Abderhalden test is rendered negative by the addition of serum antitrypsin.** *Ibid* 6–7.—Not only fatty acids, but also serum albumin tend to retard auto-digestion, while the addition of serum globulin seems to promote the appearance of dialyzable substances, probably on account of the digestion of the globulin by the serum enzyme. **V. The serum is the source of dialyzable substances.** *Ibid* 7–8.—B. states that the serum of a pregnant individual placed in contact with placenta at 0° and sepd. from the placenta by subsequent centrifugation, is capable of giving up dialyzable substances if placed in the incubator. The explanation for the appearance of amino acids and polypeptides in such a serum was that the serum acquired the ability to digest itself. V. C. Myers.

Application of the serum-skin test to the diagnosis of pregnancy and different pathological conditions. J. Bronfenbrenner. Pittsburgh. *Proc. Soc. Exp. Biol. Med.* 12, 48–9(1914).—Two cc. of the patient's serum are injected into a guinea pig and the next day the guinea-pig blood is collected. This blood, containing at the same time complement and antibody is allowed to form anaphylatoxin in a test tube by

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combining it with tuberculin, placenta, tumor tissue or any other substratum, after which the serum is collected and injected into a normal guinea pig. The test can be made by intravenous or intracutaneous inoculation. In the first case one obtains an acute anaphylactic shock, in the second a local reaction described by B. as serum-skin test. V. C. MYERS.

Atrophy does not involve acceleration of tissue enzyme action. M. MORSE. Univ. Wisconsin. *Proc. Soc. Exp. Biol. Med.* 12, 46–7(1914).—The hypothesis is advanced that in atrophying tissue some change, perhaps in the permeability of the muscle, or in the blood supply, permits the rapid drainage of products of hydrolysis to take place, thus gradually reducing the amt. of tissue. In some cases, phagocytosis, stimulated by a precedent lesion, assists in the process of transfer of materials. V. C. MYERS.

Fibrinogen deficiency in hemophilia. A. F. HESS. New York. *Proc. Soc. Exp. Biol. Med.* 12, 54–5(1914).—Expts. are reported by H. which show that in hemophilia there is a functional deficiency, qual. or quant., of fibrinogen. This, however, does not seem to constitute the essential defect in this disease, for the addition of fibrinogen was frequently not able to bring the coagulation time to normal, nor did the local application of fibrinogen to the bleeding point bring about effective clotting. It is probable that a deficiency may be associated with other pathological conditions. V. C. MYERS.

Cholesterol atheroma in rabbits. C. H. BAILEY. Stanford Univ. *Proc. Soc. Exp. Biol. Med.* 12, 68–70(1914).—The expts. of Ignatowski and Chalatow, in which they produced atheroma of the aorta by feeding rabbits on egg yolk or pure cholesterol, were repeated. Each of a series of rabbits was given the yolk of one egg daily, mixed with its ordinary food. Other rabbits received daily from 0.2 to 0.5 g. of pure cholesterol dissolved in cottonseed oil, mixed with their regular food. Three rabbits have thus far come to autopsy, one on an egg diet for 30 days, another for 77 days, the third on a cholesterol diet for 37 days. All 3 rabbits showed pronounced lesions. V. C. M.

Serological analysis of a case of serum sickness in a human being. R. WEIL. New York. *Proc. Soc. Exp. Biol. Med.* 12, 37–8(1914).—On the day following the subsidence of the serum sickness, the patient's blood was found to contain both antibody to horse serum, and remnants of horse serum itself. Since this is in harmony with expts. on animals, the facts appear to indicate that the disease is due to the interaction of these factors, in accordance with an hypothesis suggested by Pirquet. V. C. MYERS.

Cellular processes in the latent period. R. WEIL. New York. *Proc. Soc. Exp. Biol. Med.* 12, 38–9(1914).—The cells absorb antibody from the blood during the first stage of the latent period. These antibodies can unite with the antigen, and the cells can thus be desensitized, but this reaction produces no cellular contraction in the sensitized muscle cells. The cells activate the absorbed antibody during the second stage of the latent period, in such wise that the reaction with antigen produces a cellular stimulus, with muscular contraction in case of the uterus. It is for this reason, that the combination of antigen and antibody in the blood never produces an anaphylactic response. V. C. MYERS.

The vascular response in poisoning from diphtheria toxin. H. B. MYERS AND G. B. WALLACE. New York. *Proc. Soc. Exp. Biol. Med.* 12, 43–5(1914).—In view of the marked structural changes found in the smaller blood vessels, and of the failure of these to respond in the normal way to epinephrine, M. and W. conclude that the chief factor concerned in the circulatory collapse in poisoning with diphtheria toxin is the arteriole and capillary dilatation. V. C. MYERS.

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Dialysis experiments with Abderhalden's method simplified and modified by Pregl and the clinical results. M. DE CRINIS. *Fermentforschung* 1, 13–9(1914).—Twenty-two sera of pregnant women decomposed placenta, but not any other tissue; 13 normal sera (non-pregnant) showed no trace of power to cause placenta decompn. In 17 cases of *dementia praecox*, the sera decomposed testicular tissue; in other psychic disorders where *dementia praecox* was with certainty excluded by clinical symptoms this test of testicular tissue decompn. was negative, except one case. Of 25 cases in which sera decomposed normal lung tissue, there were definite symptoms of lung disease in each case; when these symptoms were absent no lung tissue decompn. was caused by the serum. Similar results are given concerning the decompn. of brain cortex tissue by sera of patients subject to diseases of the central nervous system; also of liver and thyroid tissues decomposed by sera of subjects showing diseases of the liver and thyroid, respectively. W. A. PERLZWEIG.

Influence of sickness of cattle on the milk. F. ZARIBNICKY. *Arch. Wiss. u. Prakt. Thierheilk.* 40, 355–81(1914); *Expt. Sta. Record* 32, 478–9.—The effect of each of the following diseases was studied: mastitis, foot and mouth, catarrh, endometritis, pyelonephritis, and diseases of the respiratory organs. Variations in the compn. of the milk were obtained as follows: *Fat.* Considerable variation in which both increases and decreases in the fat content were observed, ranging from 9.5% in the hoof and mouth disease to 1.7% in mastitis. *Lactose.* Changes not as great as with the fat; range between 4.5% and 5.5%; several cases as low as 1%. *Ash.* Little variation. *Casein.* Lower than normal except in cases of mastitis and foot and mouth disease. The specific gravity varied but little except in cases of abnormally high or low fat content. W. A. PERLZWEIG.

The theory of decomposition of calcium salts. P. KRANZ AND R. E. LIESEGANG *Deut. Monatsch. Zahnheilkunde* 1914, 628–30.—It was known that in osteomalacia and rachitis the ratio of the carbonate to the phosphate of Ca in the bones is the same as in normal bones. This fact could not be explained on the basis of the theory of the solvent action of acids, since under ordinary conditions acids dissolve $CaCO_3$ much more rapidly than $Ca_3(PO_4)_2$. K. and L. found a possible explanation by studying the same reaction under conditions involving colloids. They found that acids when acting upon a mixt. of $CaCO_3$ and $Ca_3(PO_4)_2$ in a gelatin soln. dissolve both salts with the same velocity, so that the undissolved residue gave upon analysis the original ratio of the two salts. W. A. PERLZWEIG.

Immunized milk in the prophylaxis and treatment of typhoid fever. JULIUS ROSENBERG. *Med. Record* 88, 742(1915).—R. cites an unpublished report of Park (New York City Health Research Lab.) in confirmation of his earlier expts. (*C. A.* 8, 170). The ingestion of milk from goats or cows immunized to *B. typhosus* confers immunity to human beings. The presence of antibodies in the circulation is shown by the agglutination test. A. H. RAHE.

Relation of nasal symptoms to entamebic infections of nose and mouth. ALEXANDER C. HOWE. *Med. Record* 88, 604–6(1915).—A certain group of nasal symptoms simulating paroxysmal coryza is frequently associated with the presence of entameba in the mouth or nose or both. Occasional toxemia or anaphylaxis is due to absorption of protein from the entameba. A. H. RAHE.

Pancreatic ferment determination in pulmonary tuberculosis. E. A. GRAY AND OLGA PICKMANN. Chicago. *J. Am. Med. Assoc.* 65, 1271–3(1915).—A study of over 200 cases in which trypsin was detd. by the Fuld-Gross method, and amylopsin by the Wohlgemuth method preceded by a calomel and Seidlitz catharsis, is given with the following conclusions: Pancreatic secretions are seriously diminished by the

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toxins of tuberculosis, in any stage. Rest, by reducing the production of toxins, aids in the return to a normal production of these secretions. Persistently low trypsin readings are prognostically bad. Low amylopsin values are of lesser prognostic importance. All interpretations of indexes must be made with due consideration for anorexia, overeating and diarrhea. L. W. RIGGS.

Pancreas extract in glucosuria from pancreas insufficiency. A. MASSAGLIA. *Gass. ospedali clin.* **36**, No. 55(1915); *J. Am. Med. Assoc.* **65**, 1148.—M.'s expts. with guinea pigs showed that feeding pancreas to animals suffering with pancreatic insufficiency, arrested or diminished the alimentary glucosuria already installed. When pancreas was given with sugar, no sugar appeared in the urine unless very large amts. were taken. L. W. RIGGS.

THOMAS, B. A. AND IVY, R. H.: **Applied Immunology.** Philadelphia: J. B. Lippincott Co. 325 pp. $4.00.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Action and resorption of mercury preparations, particularly of "Kontraluesin." DÖHRING. *Deut. med. Wochschr.* **41**, 74(1915).—From expts. on rabbits with injections of insol. Hg preps. and X-ray pictures at different intervals, it was seen that Hg salicylate is resorbed more rapidly than 10–40% HgCl. "Mercinol" is resorbed still more slowly. "Mercinol" is a 40% suspension of metallic Hg in lanolin and oil. "Kontraluesin" (Richter) is resorbed nearly as rapidly as Hg salicylate. ("Kontraluesin" contains in 1.5 cc. about 0.15 g. metallic colloidal Hg, suspended in an aq. soln. containing 0.4% $HgCl_2$, 0.05% As and P, and traces of quinine, sozoiodol and salicylic acid.) The same order of absorption rate of these prepns. was detd. in expts. in which rabbits received the injections in the hind leg, the place of injection was excized after periods of time and the Hg still present detd. quantitatively. In order to kill the *Spirocheta pallida* in human syphilitic efflorescences, it is calcd. that of HgCl 46 mg. Hg must be resorbed, of Hg salicylate 63 mg. Hg, of "Mercinol" 66 mg. Hg, and of "Kontraluesin" 187 mg. Hg. S. AMBERG.

Cases of death after salvarsan. B. FISCHER. *Deut. med. Wochschr.* **41**, 976–8 (1915).—Local necrosis at place of injection and hemorrhagic encephalitis are proved to be caused by salvarsan. Cases of death after salvarsan cannot be ascribed to salvarsan without the most careful post-mortem examn., including, where necessary, a chem. examn. Salvarsan does not injure the liver cells. The toxic action of salvarsan does not correspond to an As intoxication. S. AMBERG.

The subcutaneous method of narcosis by magnesium salts (sulfate and glycerophosphate). R. KOBERT. *Deut. med. Wochschr.* **41**, 1090–1(1915).—Zuelzer recommends subcutaneous injections of 25% Mg glycerophosphate in cases of tetanus, 10 cc. 6 to 8 times a day. This Mg salt is less irritating in subcutaneous injection than the sulfate; it lowers the blood pressure less, but it was more toxic with relation to its Mg content than the sulfate for guinea pigs, cats, rabbits and dogs. S. AMBERG.

The influence of hypophysis extracts on diuresis. A. v. KONSCHEGG AND E. SCHUSTER. *Deut. med. Wochschr.* **41**, 1091–3(1915).—Various exts. of the hypophysis, provided the dose is not too high lead, on intravenous injection in rabbits, to an increased diuresis. But when these expts. are carried on for a longer period of time, that is, more than 20 min., the urine secretion is decreased. The preps. used were pituglandol (La Roche) and pituitary-vaporole (Burroughs, Welcome & Co.). With small doses this decrease may not occur, with larger doses the initial increase gives place to a decrease, and with still larger doses there may occur a complete cessation of urine secretion, lasting about 10 min., while in the further course the secretion remains below

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normal. This inhibition occurs in spite of the large amt. of water given to the animals and while the water content of the blood is increased. If a renewed injection of a small dose of hypophysis ext. is given to an animal whose urine secretion has decreased in consequence of medium doses of ext., an increase of the diuresis of short duration may occur. Individuals with undisturbed kidney function received hypophysis exts. with the result that the secretion of urine dropped. Together with the diminution in the output of water a diminution of the chlorides, total N and phosphates occurred. The effect followed the injection immediately and was still distinct after 16 hrs. A case of diabetes insipidus was studied. It was a true diabetes insipidus giving the Erich Meyer reaction, that is, on addition of NaCl to the diet the salt was excreted, but at the same time the amt. of water given off through the kidneys increases very markedly. In this case the administration of hypophysis ext. was followed by a very marked decrease in the amt. of urine, and here this decrease was not accompanied to any extent by a retention of the solids, in contrast to the findings in normal individuals, where, following the injection of the ext., the decrease in the excretion of water is accompanied by a decrease in the excretion of the solids. The diabetes insipidus patient under the influence of the ext. lost his increased thirst so that the intake of water fell to the normal. S. AMBERG.

The influence on nitrogen metabolism of sodium *l*-glycerophosphate and synthetic sodium glycerophosphate administered hypodermically. PIETRO MONTUSCHI. Florence. *Arch. farm. sper.* 20, 29–37(1915).—Sodium *l*-glycerophosphate, administered hypodermically, causes a slight increase in the elimination of urea, which, however, is considerably less than that produced by the synthetic racemic product. The latter appears to have a greater accelerating effect upon nitrogenous metabolism. A. W. DOX.

The antidotal reaction between hydrogen sulfide and salts of heavy metals in the stomach. RODOLFO MENEGUZZI. Univ. Padua. *Arch. farm. sper.* 20, 67–81(1915). —Colloidal HgS, CuS, and PbS when introduced into the stomach in moderate doses are harmless. Contact with the digestive juices or the mucosa promptly changes the colloid from sol to gel. A. W. DOX.

Studies on the action of glycerol. I. The hemolytic action of glycerol in vitro and in vivo. ITALO SIMON. Univ. Padua. *Arch. farm. sper.* 20, 120–65(1915).—The hemoglobinuria which is produced in rabbits by subcutaneous or intraperitoneal injection of glycerol is probably due to a disintegration of red corpuscles which come in contact with it after being exuded from the blood vessels. The intensity of hemoglobinuria depends solely upon the dose of glycerol and not upon the concn. of the soln. On the other hand, the red corpuscles are dissolved *in vitro* by aq. solns. of glycerol, regardless of concn. A distinction must, therefore, be made between hemolysis and hemoglobinuria. The latter occurs only when the hemoglobin is liberated in too great an amt. to be disposed of in the usual way. A. W. DOX.

Variations in character and distribution of renal lesions produced by compounds of arsenic. L. PEARCE AND W. H. BROWN. *Proc. Nat. Acad. Sci.* 1, 463–4(1915). —Both the so-called tubular and vascular nephritis are produced by As compds. The difference in the effect of these compds. is explainable on the basis of their compn. H. DUBIN.

The collection of radium emanation and its preparation for therapeutic use. ROWLAND S. BOSWORTH. General Memorial Hospital, N. Y. *Trans. Am. Electrochem. Soc.* 28 (advance copy) (1915).—It is better to use Ra Em, rather than the Ra salt, on account of its smaller vol., ease with which the dose can be varied, avoidance of loss of Ra, and greater certainty of action. In the Ramsey method for purifying

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Em, used at the Ra Inst. of London, the gases above an aq. soln. of Ra salt are allowed to expand into an exhausted vessel. Sparking unites the H_2 and O_2, P_2O_5 removes water, NaOH removes CO_2 and liquid air condenses the Em, while the excess of H_2 and the He are pumped off. In the Duane method, used by B., H_2 and O_2 are removed by a glowing Cu wire coated with CuO, and CO_2 and H_2O are removed as before. He need not be removed for medical work. For direct application to a tumor, the Em is sealed in glass capillaries of 0.3 mm. internal diam.; these can be inserted into the tissue with a hypodermic needle. The active deposit from Ra Em may be collected on the inside of a Pb cylinder, the latter flattened, and used for application. Or the deposit may be collected on NaCl for 3 hrs., the salt dissolved in water, and the active soln. injected. α-Rays should be removed by a Pb sheet 0.1 mm. thick, for they have the least penetrating power. β-Rays can be used on the body surface, but for deeper treatment with γ-rays, the β-rays should be removed with a layer of Pb or Ag 1 to 2 mm. thick, to avoid burns. SHERMAN EASTMAN.

Synergy and antagonism of drugs and poisons. I. TRAUBE AND N. ONODERA. Charlottenburg. *Intern. Z. physik. Chem. Biol.* 1, 133–47(1914).—The synergic or antagonistic reactions of drugs may be regarded as direct effects (diminution of soln. pressure) or as indirect effects (increase or decrease of reaction velocity of physicochemical processes). Measurements by the stalagmometric method of various mixtures were made. The relative strengths of alkaloids as measured by this method are, in descending order, nicotine, pilocarpine, atropine, physostigmine, quinine, aconitine and veratrine. E. M. FRANKEL.

Collected abstracts in the field of pharmacology, April to June, 1915. CARL BACHEM. Bonn. *Zentr. Inn. Med.* 36, 549–56(1915). J. T. MYERS.

The influence of decerebration on the convulsant action of caffeine in frogs. T. S. GITHENS. Rockefeller Inst. *Proc. Soc. Exp. Biol. Med.* 11, 166–7(1914).—The action of caffeine upon decerebrated frogs is much greater in the cold. If the frogs are kept cold tetanus can be obtained with doses which are too low markedly to affect the muscles. In contrast to morphine G. found that both in the cold (2–5°) and in the warm (12–18°) there was no difference between normal and decerebrated frogs in their response to the convulsant action of caffeine. V. C. MYERS.

The action of radium on growing cells. F. C. WOOD AND F. PRIME. New York. *Proc. Soc. Exp. Biol. Med.* 11, 140–2(1914).—W. and P. found it impossible to cure primary carcinoma of mice by the application of 155 mg. $RaBr_2$, even when used for long periods of time. The tumors so treated, however, shrank to a fraction of their former size. The same amt. of $RaBr_2$ screened with 1 mm. of Al or 0.8 mm. brass and only 1.5 mm. distant from beating embryonic heart tissue, did not kill it in 3 hrs., nor stop the growth of connective tissue cells. The same exposure prevented the growth of the Jensen rat sarcoma, and inhibited but not wholly prevented the growth of the Flexner rat carcinoma. V. C. MYERS.

Further observations on the toxicity of tin. W. SALANT AND J. B. RIEGER. Washington. *Proc. Soc. Exp. Biol. Med.* 11, 178–9(1914).—The amt. of Sn as the double salt necessary to produce a marked albuminuria was 20–30% less than in the form Sn-tartrate. Observations on the action of stannous and stannic salts failed to show any noteworthy difference. The effect of concn. showed marked differences when injections were made either intravenously or subcutaneously, high concns. producing much more severe results. V. C. MYERS.

A case of acute and fatal poisoning caused by the vapors from waterproof paint. SIRO GRIMALDI AND CARLO RAIMONDI. Siena. *Boll. chim. farm.* 53, 369–99(1914). —A workman who was engaged in painting the inside of a large iron water tank with

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waterproof paint became ill with symptoms of poisoning on the 2nd day of this occupation and subsequently died. Investigation showed that the continued presence of the workman in an atm. of varnish vapors (benzine and turpentine were used as solvents) was the cause of the poisoning. H. S. PAINE.

Principles of bromine therapy in epilepsy. EMANUEL S. BRODSKY. *Med. Record* 88, 479–81(1915).—After prolonged administration of bromides and alkalies, Br is retained in the tissue fluids and blood, osmotic pressure being maintained through the elimination of Na. A. H. RAHE.

Elimination of potassium iodide in the urine. W. A. WOVSCHIN. New York. *J. Am. Med. Assoc.* 65, 1101–2(1915).—W. made a comparative study of the excretion of KI in the urine when administered by mouth and by rectum in 15 cases of patients with various diseases. In 13 of the cases the elimination was greater when administered by rectum. L. W. RIGGS.

Theory of narcosis. J. TRAUBE. *Arch. ges. Physiol.* 161, 530–6(1915).—Polemic. Reply to Höber (*Deut. med. Wochschr.* 41, 273 and Joel, *C. A.* 9, 1640). C. J. W.

Actions of the opium alkaloids individually and in combination with each other on respiration. D. I. MACHT. Baltimore. *J. Pharmacol.* 7, 339–73(1915). —An improved app. for studying respiration in intact unanesthetized animals is described and consists essentially of a mask placed over the animal's face connected with an air-tight tank containing water which is displaced during respiration and can be measured. A side tube in connection with the mask permits the collection of samples of air, and a bag can be attached to another tube for inhalation of gas (CO_2). Morphine and to a lesser degree codeine are sedative or depressant, while narcotine, papaverine, narceine, thebaine and cryptopine are stimulating to the respiratory center. The effects of morphine and narcotine were confirmed by perfusion of the medulla (respiratory center directly) by Hooker's method. The action of combined opium alkaloids is a summation of their individual effects. On the bronchi narcotine and papaverine are dilators; morphine is a dilator to a lesser degree, codeine still less so and the other alkaloids not at all. Morphine and narcotine act antagonistically on the bronchi, their combined effect being a lesser dilatation than that produced by each of them individually. These findings should contribute to a more rational therapeutic use of opium and its derivs. P. J. HANZLIK.

A physiological test for choline and some of its applications. REID HUNT. Boston. *J. Pharmacol.* 7, 301–37(1915).—A physiol. test is described by which 0.00001 mg. and probably less choline may be detected: As little as 0.000005 mg. of injected choline causes a distinct fall of blood pressure in a rabbit or cat. The action is on the heart and is prevented by atropine. An increased amt. of choline was found in the blood serum of some animals after removal of the adrenal glands, but it is doubtful if this indicates any specific relation between these glands and the metabolism of choline. No increase of choline was found in striated muscle after removal of suprarenals; the same is true of the serum or cerebrospinal fluid in a number of pathologic conditions (dementia, general paresis, alcoholic hallucinosis, syringomyelia, neuralgia, fracture of skull). The choline content of the cerebrospinal fluid and of the saliva was much less; that of amniotic fluid about equal to and that of urine and cardiac and skeletal muscle somewhat greater than that of blood serum. Choline injected intravenously disappeared from the blood with great rapidity; there was not an increased amt. in the heart. P. J. HANZLIK.

The seat of the emetic action of various drugs. CARY EGGLESTON AND ROBERT A. HATCHER. New York. *J. Pharmacol.* 7, 225–53(1915).—The following agents produce emesis by central action, *i. e.*, stimulation of the vomiting center, in dogs after

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removal of the gastrointestinal tract and by intravenous injections of very small doses: morphine and prepns., including narcophin and pantopium, containing it; emetine, cephaline, nicotine, lobeline, pilocarpine, aconitine, veratrine, ergot, apomorphine, sodium salicylate, picrotoxin, and digitalis compds. To produce vomiting with oral administration much larger doses are required, except in the case of emetine whose marked local irritant action is sufficient to produce vomiting with smaller doses by mouth. Sodium salicylate, in susceptible individuals, also has this synergistic reflex and central action. Some of the advantages claimed for certain proprietary prepns. of opium, such as narcophine and pantopium, as well as of salicylic acid, are refuted by the results of E. and H. P. J. HANZLIK.

The influence of salicylates on the elimination of uric acid and other waste products from the blood. W. DENIS. Boston. *J. Pharmacol.* **7**, 255–62(1915).—Large doses ("toxic") of Na salicylate administered to patients resulted in a reduction of the uric acid content of the blood. When the non-protein N of the blood was about normal, salicylate produced no effect on this fraction. However, when it was abnormally high, a considerable diminution took place after the administration of the drug. Small doses (3.3 g.) of salicylate produced no effect on the uric acid content of the blood. Accumulation of uric acid occurs as soon as the drug is withdrawn. The favorable influence of salicylate is explained as due to increased renal permeability, which is thought not to be limited to uric acid alone, but includes other waste products as well, even the supposed toxins of rheumatic fever. P. J. HANZLIK.

The physiological action of alcohol. ALONZO E. TAYLOR. *Univ. Penna. Bull.* 15 series, No. 3, Part 5, 33–54(1915).—Alc. has practically no value as a foodstuff, save in diabetes; it is not a stimulant, but acts as a narcotic. It has therapeutic properties in acute heart failure and in the crises of pneumonia and sepsis. The pathological relationships are discussed. JOSEPH S. HEPBURN.

Solvents of gutta-percha. HERMANN PRINZ. Univ. Penna. *Dental Cosmos* **57**, 342(1915).—Oil of eucalyptus and oil of cajuput dissolve gutta-percha, due to their cineole content. Oil of cloves and oil of cinnamon do not contain cineole and apparently have no solvent effect on gutta-percha. JOSEPH S. HEPBURN.

The treatment of pyorrhea alveolaris and its secondary systemic infections by deep muscular injections of mercury. BARTON L. WRIGHT AND PAUL G. WHITE. U. S. N. *Dental Cosmos* **57**, 778–80(1915).—The therapy is based on the theory that "mercury is the chem. affinity of all the vegetable parasites." Use of mercuric succinimide in treatment of 56 cases of pyorrhea alveolaris gave 100% cures and not a single recurrence. JOSEPH S. HEPBURN.

The dental medicines of Pedanios Dioscorides. HERMANN PRINZ. Univ. Penna. *Dental Cosmos* **57**, 639–45(1915).—An historical essay on pharmaco-therapeutics. JOSEPH S. HEPBURN.

Anoci-association in dentistry. RICHARD H. RIETHMÜLLER. *Dental Cosmos* **57**, 742–8(1915).—A review concerning the production of general anesthesia by nitrous oxide, and O, and of local anesthesia by novocaine-suprarenine. J. S. H.

Emetine hydrochloride and psoriasis. WM. R. CHAPLIN. Savannah, Ga. *Dental Cosmos* **57**, 189(1915).—During treatment of a patient for pyorrhea alveolaris with emetine-HCl, all symptoms of psoriasis, from which he had suffered for 15 years, entirely disappeared. JOSEPH S. HEBPURN.

Deep muscular injections of succinimide of mercury in pyorrhea alveolaris. PAUL G. WHITE. U. S. N. *Dental Cosmos* **57**, 405–8(1915).—W. reports the discovery of this treatment for pyorrhea alveolaris and demonstrates its efficiency. JOSEPH S. HEPBURN.

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The structural and other changes arizing in connection with metals used in the mouth. W. B. HEPBURN. Glasgow. *Dental Cosmos* 57, 664–70(1915).—A description of the changes undergone by metals and alloys introduced into the mouth as fillings, crowns, bridges, dentures, etc. The influence of one metal or alloy on another metal or alloy also present in the mouth is discussed. As far as possible, complexity should be avoided in inserting metals in the mouth. Darkening of Au fillings is due to metallic Cu. JOSEPH S. HEPBURN.

The therapeutic action of Buckley's desensitizing paste. HERMANN PRINZ. Univ. Penna. *Dental Cosmos* 57, 853–9(1915).—The pharmacology of this mixture of neothesin, thymol and trioxymethylene is discussed. Whatever anesthetic power the paste may have, is due to the neothesin; and the quantity of paste used in an application does not contain sufficient neothesin to act as a local anesthetic. The quantity of the "painful" anesthetic thymol is such that it possesses no anesthetic action. The trioxymethylene evolves HCHO, a protoplasmic poison, which may penetrate sound dentin and devitalize the pulp. A mixt. of methylene blue, which stains devitalized dentin but is without action on sound dentin, and trioxymethylene was inserted in a drilled cavity, surrounded by sound dentin, in a living tooth; after 48 hrs. the tooth was extracted and sections cut; a blue strip existed from cavity to pulp chamber, and the entire pulp was also stained. Presence of HCHO in the pulp, and in the hard tooth structure was demonstrated by the morphine sulfate reaction. Similar results were obtained on insertion of a mixture of Buckley's paste and methylene blue. Prinz concludes that HCHO is the only active constituent of the paste when applied in routine quantities, and that the paste is an unsafe remedy. JOSEPH S. HEPBURN.

Radioactive substances and their therapeutic application in dentistry. HERMANN PRINZ. Univ. Penna. *Dental Cosmos* 57, 150–5(1915).—A description of the physics and chemistry of the radioactive elements, their biologic and physiologic action, and their therapeutic application in dental diseases. JOSEPH S. HEPBURN.

Investigation of Entameba buccalis. ERNEST STURRIDGE. London. *Dental Cosmos* 57, 780–2(1915).—The ameba is destroyed by the electrolytic action of the current in the passage of antiseptic ions with 3 to 5 milliamp. The treatment of pyorrhea by ionization is recommended, using $ZnCl_2$ as the source of the antiseptic Zn ion. JOSEPH S. HEPBURN.

The chemical constitution and the physico-chemical properties of dental amalgams. JAMES W. MCBAIN AND W. A. KNIGHT. Univ. Bristol, Eng. *Dental Cosmos* 57, 630–9(1915).—The binary systems Ag–Sn, Sn–Hg, and Ag–Hg are reviewed and the ternary system Ag–Sn–Hg is discussed at length. Detn. of the wt. of Hg retained by "unaged" and "aged" filings of the alloys of Ag—Sn after amalgamation demonstrated that "aging" depends on the % of Ag_3Sn in the alloy, being greatest for Ag_3Sn and entirely absent for pure Ag and pure Sn. "Aging" is a polymorphic change. The alloys Ag_3Sb, Cu_3Sb, Cu_3Sn do not "age." When Au is present in small amt. (about 0.077%, by wt., of the total Hg used), in amalgamation of Ag, Sn, or Ag_3Sn filings, *all* the Au remains in the solid amalgam, no Au being in the squeezed-out Hg. During amalgamation a considerable decrease in vol. occurs. The hardened amalgam also undergoes a contraction, which is more marked in "aged" than in "unaged" alloys, as was shown by observing the alloys kept beneath organic liquids in sealed-in dilatometers in a thermostat until constant vol. was attained. The application of these facts in the practice of dentistry is pointed out. JOSEPH S. HEPBURN

The chemistry of dental amalgam alloys, with some considerations concerning their physical properties. WM. W. ATKINSON. Philadelphia, Pa. *Dental Cosmos* 57, 415–23(1915).—The classification of alloys, vol. changes, shrinkage and expansion of amalgams, the corrosion of amalgam fillings in the mouth and the resulting change

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of form are discussed. A. concludes that a chem. compd. of metal with metal is the most suitable alloy for filling, since it is homogenous (if correctly melted), closely organized, condenses on cooling and thus acquires the property of expansion on amalgamation, "sets" promptly after amalgamation and gives the filling rigidity, strength and power to resist corrosion. JOSEPH S. HEPBURN.

Blood changes produced by nitrous oxide and oxygen anesthesia in both man and lower animals. THEODORE D. CASTO. Postgraduate School of Dentistry, Phila. *Dental Cosmos* **57**, 881–92(1915).—Spectroscopic examn. of blood, taken from rabbits at intervals during N_2O and air anesthesia, showed that the amt. of hemoglobin was continually reduced, the greatest reduction occurring when the animal was cyanosed and near collapse. The time required for coagulation of the blood was reduced on the av. by more than 1 min. Similar expts. on rabbits under N_2O and O anesthesia showed a progressive decrease in the hemoglobin content of the blood. In man, during N_2O and O anesthesia, the time required for coagulation of the blood was reduced on an av. by more than 1 min., and returned to normal in about 20 min. after discontinuance of the gas. The systolic blood pressure tended to increase. The number of erythrocytes was decreased 10% on an av., but their morphology was unchanged. Differential counts of the leucocytes are reported. The number of white cells usually increased about 25%; polynuclear neutrophiles decreased about 15%. JOSEPH S. HEPBURN.

Oxidation and reduction of hydrogen peroxide. GEORGE T. FETTE. Ohio College of Dental Surgery. *Dental Cosmos* **57**, 615–27(1915).—The oxidation and the reduction of H_2O_2 are discussed from the viewpoint of the ionic theory. The author concludes that on oxidation, H_2O_2 does not go directly to H_2O and that the free O all comes from the dioxide, while on reduction H_2O_2 passes to H_2O and no O is given off. The relationship of these facts to the therapeutic application of H_2O_2 is pointed out. JOSEPH S. HEPBURN.

Rare earths in therapy. C. RICHARD BÔHM. *Z. angew. Chem.* **28**, I, 333–6, 346–8(1915).—Review of the history, prep., and uses of cerium, mesothorium, and thorium X in therapy. B. HOROWITZ.

Physiological action of physostigmine and its action on denervated skeletal muscle. J. N. LANGLEY AND T. KATO. *J. Physiol.* **49**, 410–31(1915).—Muscular movements produced in the anesthetized cat or rabbit by physostigmine (eserine salicylate) are largely of central origin. All these contractions in striated muscle are decreased or stopped by atropine. Twitchings caused by physostigmine and of peripheral origin are not affected by atropine, but may be controlled by large amts. of $CaCl_2$. After the motor nerves are barely paralyzed by curari, nerve irritability can be raised by physostigmine above the normal level without causing twitchings. When curari is given in amts. 2 to 3 times as great as that just sufficient to paralyze the motor nerves, physostigmine in large amts. neither restores irritability nor causes twitchings. Evidence supports the theory that physostigmine acts both on the neural region of the muscle causing tonic contraction and on the nerve endings causing twitching. J. F. LYMAN.

The influence of the intra-intestinal administration of magnesium sulfate on the production of hyaline casts in dogs. F. L. GATES. Rockefeller Inst. *Proc. Soc. Exp. Biol. Med.* **12**, 59–60(1914).—When an 0.1 *M* soln. of $MgSO_4$ was injected into the upper duodenum of dogs in doses of 0.18–0.2 g. per kg., 10 out of 12 animals showed hyaline casts; in 8 the casts were abundant. They were usually accompanied by a trace of albumin. V. C. MYERS.

The effect of pituitary substance upon the pulse form of febrile patients. A. W. HEWLETT. Univ. Mich. *Proc. Soc. Exp. Biol. Med.* **12**, 61–2(1914).—In a recent study of dicrotic and monocrotic pulse forms it was shown that these are always ac-

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companied by a transient backward movement of the blood column in the brachial artery, just after the entrance of the primary pulse wave. Further observations indicate that this type of pulse is common in fever patients and that it is rarely marked in normal individuals. This type of pulse as it occurs in febrile patients may be converted into a normal form by therapeutic doses of a pituitary prepn. V. C. M.

Destruction of typhus bacilli in the organism of the rabbit. E. HAILER AND G. WOLF. *Arb. kais. Gesundh.* **48**, 80–9(1915).—Rabbits infected directly in the gall bladder with typhus bacilli were treated with substances previously found active (*C. A.* 8, 2738): *phenols*—*m*-xylenol, thymol and pyrogallol; *hydroxy acid*—salicylic; *ethereal oils*—sandalwood oil, pinene, eucalyptol and cinnamon oil; also *m*-hydroxybenzoic acid and salvarsan. Only the cinnamon oil proved efficacious in freeing the organism from the bacteria. W. A. PERLZWEIG.

Effect of intravenous injection of radium on a persistent positive Wassermann reaction. WINFIELD AYRES. *Med. Record* **88**, 610(1915).—After treatment with Ra, cases previously giving persistently positive Wassermann reactions, gave negative reactions. A. H. RAHE.

Treatment of septic wounds by the electrolytic bath. FRANK FOWLER. *Brit. Med. J.* **1915**, II, 433–4.—An application of the discovery of Russ (*Proc. Roy. Soc. Med. Electro-therap. Sec.* **8**, 45) that a small current passing through NaCl solution is lethal to most bacteria and carries them towards the anode. A. H. RAHE.

The first clinical experiments with Van Swieten's liquor. GUGLIELMO BILANCIONI. Univ. Rome. *Arch. farm. sper.* **20**, 180–92(1915).—Historical. A. W. DOX.

The difference in the response of animals of different ages to a constant quantity of uranium nitrate. W. DE B. MACNIDER. Univ. No. Carolina. *Proc. Soc. Exp. Biol. Med.* **11**, 159–62(1914).—Dogs (48) varying in age from a few mos. to old age were given $(NO_3)_2UO_2.6H_2O$ subcutaneously in the dose of 6.7 mg. per kg. on 2 successive days. In over 90% of the older animals glucosuria appeared within 24 hrs. following the first injection, while in 90% of the puppies it was absent until the second injection. The puppies and young animals which show a low % of glucose in the urine show a small amount of fat in the liver and kidney. V. C. MYERS.

The comparative importance of pressure and of toxicity of tricresol in subdural injections of sera. C. B. FITZPATRICK, J. P. ATKINSON AND A. ZINGHER. Dept. Health, N. Y. *Proc. Soc. Exp. Biol. Med.* **11**, 182–3(1914).—Somewhat contradictory results were obtained as regards tricresol, although in most cases concns. of 0.1–0.4% appeared to exert no harmful effects as judged by the blood pressure. Pressure appears to be a factor of real danger. V. C. MYERS.

Respiration and circulation in picrotoxin convulsions (POLLOCK) **11G.**

SPIEGEL, L.: **Chemical Constitution and Physiological Action.** Trans. by C. Luedeking and A. C. Boylston. New York: Van Nostrand Co. 162 pp. $1.25.

I. ZOÖLOGY.

R. A. GORTNER.

The ash of clam muscle in relation to its osmotic properties. EDWARD B. MEIGS. *J. Biol. Chem.* **22**, 493–8(1915); cf. *C. A.* **6**, 1770; **8**, 1170.—The vitreous portion of the adductor muscle of *Venus mercenaria* was analyzed for H_2O, solids, total ash, Na, K, Ca, Mg, Fe, P, S and Cl. The results show a preponderance of bases. Clam muscle remains irritable for more than 40 hrs. in 20% sucrose soln., although in that time it loses 86% of its Na, 75% of its K, 28% of its P and all of its Cl. I. G.

Chemical and physico-chemical investigations of the blood of the anodonta. D. CALUGARENU. *Bull. acad. sci. Roumanie* **3**, 216–9(1914–5); *Chem. Zentr.* **1915**, I.

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1129–30.—The osmotic concn. of the blood of the anodonta is 7 times that of fresh H_2O. Expts. were carried out to det. whether the skin is semi-permeable or impermeable. On subjecting the animals to a diminished diet for a period up to 80 days in fresh H_2O, the f. p. of the blood fell about 36% (from 0.110 to 0.070°) and the elec. cond. about 31% (from 31.646×10^{-4} to 23.342×10^{-4}). Chem. analysis showed a decrease in dry substance, org. matter, and ash. C. explains these facts as follows: The skin permits the blood crystalloids to diffuse into the surrounding H_2O. This diffusion takes place under normal conditions, the loss being compensated for by new growth from food. The diminution in distd. H_2O amts. to 40% or 34% in 25 days. In salt H_2O of higher concn. and free from nourishment, the blood concn. rose to that of the surrounding liquid. In moist air free from nourishment the blood concn. showed a notable increase after some days. F. W. Smither.

The nutrition of aquatic animals by the dissolved organic compounds of water. Alexander Lipschütz. Bonn. *Ergebnisse Physiol.* 13, 1–46(1913).—A critical résumé of the theory of the nutrition of aquatic animals by dissolved organic compds. present in the water in which they live; such factors as the food requirement of aquatic animals, the quantity of food present as plankton organisms, the content of sea H_2O in dissolved organic compds., and the food found in the digestive canals of the animals, are discussed. The expts. of various investigators on the nutrition of the following animals by dissolved organic compds. (usually nitrogenous) are discussed: fish, the coral animal, *Ascidia mamillata* (one of the *Tunicata*) and crustaceans. J. S. H.

The effect of lead on the germ cells of the male rabbit and fowl as indicated by their progeny. L. J. Cole and L. J. Bachhuber. Wis. Agric. Exper. Sta. *Proc. Soc. Exp. Biol. Med.* 12, 24–9(1914).—The offspring produced by male rabbits which have been poisoned by the ingestion of $Pb(OAc)_2$ into the alimentary tract have a lower vitality and are distinctly smaller in av. size than normal offspring of unpoisoned males. In an extensive series of expts. on fowls poisoning of the male parent with Pb likewise resulted in offspring of a distinctly lower av. vitality. V. C. Myers.

The effect of carbon dioxide on the eggs of Ascaris. T. S. Painter. Yale Univ. *Proc. Soc. Exp. Biol. Med.* 12, 62–4(1914).—The undivided eggs of *Ascaris megalocephala* (var. *bivalens*) were kept in an atmosphere of CO_2 for 3 months. On the removal of the eggs from the gas, a few smears were allowed to undergo full development. Only about $^1/_3$ of the embryo were normal, the remainder being either masses of disorganized cells or embryos in which the posterior end was differentiated, together with the primordial germ cells. Two distinct and independent causes were found for the abnormal development. The first of these was the fusion of the chromosomes in the equatorial plate phase of the dividing S_1 blastomere. The second type of abnormality consisted in a shifting of the positions of the A and B blastomeres and their derivatives. V. C. Myers.

12. FOODS.

W. D. Bigelow and F. F. Fitzgerald.

Change in starch in potatoes during drying. A. Huitzinga and H. J. F. de Vries. *Chem. Weekblad* 12, 268–72(1915).—The expts. of Waterman (*C. A.* 9, 1352) were repeated, but his results could not be duplicated. George W. Morey.

Chlorine determination in bread. J. D. Filippo and W. Adriani. *Chem. Weekblad* 12, 805–7(1915).—Place 5 g. of dry powdered bread in a 50 cc. graduated flask and fill to the mark with HNO_3 from a buret. The vol. of the bread is found from the reading of the buret. The liquid in the flask is vigorously shaken for 10

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min., filtered and the Cl detd. in 20 cc. according to Volhan. As the vol. of the bread is known, the Cl content is easily calcd. This method gives the total Cl content of the bread, including the original Cl present in the flour. To derive the ash content of the flour from which the bread was made det. the "sulfate ash" of a 10 g. sample (cf. *C. A.* 9, 2950) of the bread; det. by the direct method the NaCl; deduct from this 12.5 mg. which is the av. NaCl content of flour; calc. the Na_2SO_4 equiv. to the remaining NaCl and subtract this from the sulfate ash; then deduct 5 mg. as a correction for the ash content of yeast. The result is the sulfate ash of the flour. This multiplied by $^{40}/_{9}$ gives the true ash content of the flour. In 2 examples the ash detd. in this way was 0.66% and 0.63%; direct detn. gave 0.64% and 0.59%, resp. J. T. Flohil.

Determination of sodium chloride and ash in bread. C. K. Zylstra. *Chem. Weekblad* 12, 754–8(1915).—Detn. of NaCl in bread with and without addition of Na_2CO_3 showed differences as high as 0.7%. The ashing was done in a muffle at dull red heat. Z. concludes that the loss of NaCl is not caused by mere volatilization, but also by chem. action, very probably by acid phosphates in the grain. Z. investigated the action of KH_2PO_4 and K_2HPO_4, when heated with NaCl. A mixt. of 1 g. NaCl and 1.995 g. KH_2PO_4 was heated for 2 hrs.; the weight of NaCl in the resulting fusion was 0.695 g., while 1.770 g. NaCl heated at the same temp., but for 12 hrs., lost only 0.004 g. in weight. By heating KH_2PO_4 alone and with NaCl evidence was obtained that the reaction is as follows: $2\ KH_2PO_4 + 2\ NaCl \longrightarrow K_2Na_2P_2O_7 + H_2O + 2$ HCl. J. T. Flohil.

Criterion for the genuineness of vinegar. N. Tarugi. *Boll. chim. farm.* 53, 129–37(1914).—After its acidity has been detd., the vinegar is diluted so as to contain 0.6% AcOH (V = 10,000) and its elec. cond. is measured at 25°. Examn. of a series of 33 samples of genuine vinegar gave 7.92, 9.81 and 11.36 as the min., mean and max. values of the mol. cond., M. Under similar conditions the value for pure AcOH was 5.69 and that for a com. sample containing 31.8% AcOH was 5.70; the mol. cond. of vinegar would, therefore, be appreciably lowered by the addition of any considerable proportion of AcOH. Com. samples which had been adulterated with 0.5–3.8% of NaCl or with 2.0% of K_2SO_4 gave mol. conds. of 11.81–18.88. The addition of small proportions of mineral acids also increases the cond. Thus, for diluted vinegars containing 0.59% of AcOH and 0.01% of HCl, H_2SO_4 and HNO_3, resp., the corresponding values of M were 14.99, 14.20 and 12.27, the value for the original vinegar being 11.10. The vinegar was next neutralized with NaOH (prepd. from the metal), diluted to V = 10,000 and the cond. was again measured at 25°. After this treatment a series of 19 samples of genuine vinegar gave values for the mol. cond. M', which varied between 59.4 and 88.05. The ratio $M' : M$ has the min., mean and max. values 6.66, 7.94 and 9.98, resp. The corresponding value for pure AcOH is 12.14, while the vinegars adulterated with NaCl or K_2SO_4 gave values between 4.17 and 5.72; those which contained 0.01% of HCl, H_2SO_4 and HNO_3 gave the values 4.82, 4.77 and 5.67, resp. A sample of vinegar which was suspected to contain added AcOH, gave M = 7.65, M' = 82.1, and $M' : M$ = 10.7. No relation exists between the value of the ratio $M' : M$ and the proportion of dry ext. present in a vinegar. H. S. Paine.

Detection of coal-tar dyes in food stuffs. G. Possetto and G. Issoglio. *Giorn. farm. chim.* 63, 390–402(1914).—P. and I. classify foods with reference to the various coal-tar dyes which are used for coloring the same and then discusses the dyes of each group. A scheme for sepn. of yellow coal-tar dyes is appended. H. S. Paine.

The determination of added sugar in jams (containing starch sirup). C. L. Jungius. Amsterdam. *Chem. Weekblad* 12, 612–3(1915).—The assumptions made are that the fruit used contains the av. content of sucrose found in ordinary ripe fruit, and that equal parts of fruit and sugar (or sugar + starch sirup) were used. If x =

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total invert sugar after Clerget, y = % starch sirup, P = rotation in saccharimeter degrees after Clerget, and R = the amt. of invert equivalent in reducing power to 100 parts jam, then $-0.01(43 - 0.5t)0.95x + 1.6y = P$ and $x + 0.4y = R$. In most cases $P/R = 4$; hence $x = (4R - P)/[4 + 0.0095(43 - 0.5t)]$. If P/R is not 4, this is to be changed to correspond. If a = % sucrose in the fruit used, s = % sucrose added and $f = 1 + 0.01a$, then when sucrose alone is used, $s = 0.95\ x/f$. If starch sirup is also used, $s = (0.95x - 0.01ay)/f$. W. L. BADGER.

The detection of tallow in pork fat according to the procedure of A. Bömer. J. RÜHLE, F. BENGEN AND J. WEWERINKE. *Z. Nahr-Genussm.* 30, 59–66(1915).—In corroboration of Bömer's results (*C. A.* 8, 1174) it was found: (1) Mixts. of pork fat and tallow can be detected when containing small quantities of the latter. (2) Solid animal and vegetable fats in pork fat behave like tallow in the Bömer test. Solid vegetable fats mixed with pork fat can be detected by the phytosteryl acetate reaction. (3) The degree of solidity of the animal and vegetable fats affects the m. p. difference. (4) Natural vegetable oils in mixts. of pork fat and tallow do not hinder the detection of the latter in the m. p. test. LOUIS D. ELLIOTT.

Standards for determining the purity of milk. H. W. CONN. *Pub. Health Reports* 30, 2349–95(1915).—A series of tests was made in which the loop method was compared with the pipet. The effects of the compn. of the media, the amt. of diln., shaking of samples, method of counting, method of inoculating and period of incubation, were studied and comparison of direct microscopic examn. with plating was made. Conclusions: The loop method is irregular and hence should be discarded for the pipet method; the compn. of the media is immaterial in comparison with errors due to technic; the sample should be dild. so that the count on the plates will be between 40 and 200. Since the vigor and extent of shaking to which samples of milk are subjected cause wide variations, shaking should be eliminated. There is no difference in results whether milk is directly inoculated in Petri dishes and the agar poured upon it, or whether the milk is inoculated in the tube of melted agar and then poured into the Petri dish. Five days' incubation (48 hrs. at 37° and 72 hrs. at 20°) gives very slightly greater count than a 2-day incubation. In making a comparison of the plate count with the microscopic, the latter should be a count of groups rather than individuals, plate colonies representing groups only; experience is necessary to distinguish between dirt particles and bacteria, especially micrococci, since raw fresh milk contains few dead bacteria. The microscopical method is of no use in the study of pasteurized milk, but is of value in telling the age of the milk before pasteurization; it also is of value to the dairyman as a guide in grading his product for market. Counting on plates causes much irregularity; it should be done by the use of a lens of $3^1/_2$ diam. In the plating of cream, the inoculation should be made in the agar tube followed by thorough agitation, since plate inoculation is unreliable. J. GAUB.

The process of coagulation in Sardo sour milk. F. FIDANZA. Univ. Sassari. *Arch. farm. sper.* 20, 166–79(1915).—The curdling of this beverage is essentially a pptn. of the casein by the org. acids produced by the bacteria. Coagulation occurs in 6 to 8 hrs. at the optimum temp. of 35–45°. It is prevented by formalin, thymol, $HgCl_2$, phenol, and $CHCl_3$, and retarded by NaOH, Na_2CO_3, $CaCl_2$, $BaCl_2$ and $(CH_3)_2CO$. CHI_3 is without effect. A. W. DOX.

Contributions to the catalase determination in milk. J. PRITZKER. *Z. Nahr.-Genussm.* 30, 49–59(1915).—The catalase no., *i. e.*, the no. cc. O which corresponds to 100 cc. milk, is a valuable test on market milk. The catalase no. of a good milk should not be above 35 which is considered to be the "suspicion point." The app. for the detn. should be as simple as possible to allow of its use in the field in examn. of milk fresh from the cow. The catalase app. described by P. fulfills this requirement. It consists of

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a small tube sealed at one end, having a vol. of a little over 15 cc. and graduated to 0.1 cc., beginning at the closed end. Near the open end a small outflow tube is attached. Add 10 cc. milk and 5 cc. of 1% H_2O_2 to the app.; fit a rubber stopper into the open end till it touches the soln. at the 15 cc. mark and no air bubbles are left. With the stoppered end underneath put the tube vertically in a warm place (22–25°). After 2 hrs. the gas vol. is read. To obtain the accurate catalase no., a correction factor was worked out: $V_1 = V + \frac{V^2}{30}$, in which V_1 = the corr. vol.; V = vol. read off.

LOUIS D. ELLIOTT.

The pepsin-rennin question in the ripening of cheese. W. VAN DAM. Hoorn, Holland. *Centr. Bakt. Parasitenk., II Abt.* 44, 89–101(1915).—The author discusses at length the most recent views of the relation of pepsin and rennin in the process of cheese ripening. JULIAN H. LEWIS.

Bacteriological and chemical researches on defective cheese. J. THÖNI AND O. ALLEMANN. *Centr. Bakt. Parasitenk., II Abt.* 44, 101–115(1915).—In 4 samples of Emmenthaler cheese that were defective in their ripening, obligate anaerobic bacteria of the true butyric acid and putrefactive groups were found in relatively large numbers. The long rod-formed lactic acid bacilli, characteristic of normal Emmenthaler cheese, were few in number or entirely missing. There is found in these cheeses high fatty acids, as butyric, caproic, and valerianic acids. In 2 of the samples there was a marked disintegration of protein. Isolated putrefactive bacilli from these samples, in media containing milk and casein, produced a disintegration of the protein with the formation of products of the amino group, and caproic, valerianic, propionic, and acetic acids. In isolated cultures of the butyric acid group, there was only a small amt. of disintegration of protein but much fermentation of lactose with the formation of butyric, propionic, and formic acids. There is no doubt that these bacteria are the cause of the failure in the proper ripening of the cheese. JULIAN H. LEWIS.

The sugar beet and the products derived from it (pulp, sirup, sugar) as raw materials for bread making. M. P. NEUMANN. *Z. Ver. Zuckerind.* 65, 215–25(1915).—Bread made of 5 parts rye flour and 9 parts freshly rasped sugar beets was unsatisfactory in size and shape of loaf, consistency, and crust. The taste was suggestive of red beets. If the rasped beets stood a very short time the oxidation went far enough to render the bread much less desirable on all counts. If the beets were cooked before being rasped the bread was heavy and moist, the crust normal, and the beet taste barely discernible. Beet flour (*a*) and pulp flour (*b*) of the following analyses were used: protein (*a*) 4.1, (*b*) 5.6; fat, (*a*) 0.2, (*b*) 0.6; sugar (*a*) 60.4, (*b*) 36.1; crude fiber, (*a*) 4.7, (*b*) 9.8; N-free ext., (*a*) 22.2, (*b*) 32.7%. Bread was made with both 5 and 10% of each flour. With (*a*) very good bread was obtained, with a sweet taste hardly suggesting beets in the 5% loaves. With (*b*) the color, taste, odor, and other properties were poorer but it is concluded that the material can be of service. Replacing 5% of rye flour with sugar in the form of a sirup of 40% sucrose and 40% invert gave a normal bread with a slightly sweet taste. Bread was made containing 3% (on the wt. of flour) of beet molasses, molasses from the SrO process, and table sirups from molasses (80 Bx. 48% sucrose, 59 purity). Rizing and baking were normal, crumb excellent in all respects, color a little darker, and crust unusually good. The taste and odor of molasses were imperceptible to persons who did not know molasses had been used. With 6% the loaf was not so good and the taste and odor were plainer. All the above materials are recommended for general use except rasped beets and molasses in amts over 5%. W. L. BADGER.

Increasing the supply of bread materials. S. THIELER. *Centr. Zuckerind.* 23, 457(1915); *Wochschr. Zentralver. Rübenzuckerind.* 53, 264(1915).—Rye meal with 10%

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raw beet sugar and 1% NaCl makes good bread. The addition of sugar beet flour (cf. C. A. 9, 2158 and preceding abstr.) makes a bread that is palatable, satisfying, and keeps fresh very long. Beets to be dried must be sound, well washed, and free from coal ash. W. L. BADGER.

The preparation of bread from starch. W. OSTWALD AND A. RIEDEL. *Kolloid-Z.* 17, 12–4(1915).—Pure starch from potatoes, tapioca, etc., without the addition of wheat flour, does not make a good loaf of bread, because as Fornet has pointed out (*C. A.* 9, 2406), the dough is too short and inelastic to hold in the gas from the baking powder or yeast. The present military necessities make a starch loaf desirable; by mixing the dough made with starch and yeast or baking powder with a stiff (30%) starch paste to the extent of 15% of the total weight, a satisfactory loaf, with a good crumb, can be obtained. Such a loaf is tasteless, and means of flavoring must be developed. H. I. MATTILL.

Use of rice in bread-making. N. NOVELLI. *Giorn. risiculture* 5, 68–72(1915); *Bull. Agr. Intelligence* 6, 749–50.—The Exptl. Sta. on Rice Culture at Vercelli in conjunction with the Assoc. of Vercelli Agriculturists has carried out expts. in bread-making using wheat flour mixed with 20% of rice flour, the latter being freed only from the chaff so as to retain its superficial layers of the mesocarp which are rich in N. The bread thus obtained could not be distinguished by its organoleptic properties from full wheat bread. Analysis of white bread in small loaves made from (*a*) wheat flour only and (*b*) 80% wheat flour plus 20% rice flour gave the following results: water (*a*) 27.8, (*b*) 27.7; ash (*a*) 0.85, (*b*) 0.90; crude protein (*a*) 10.00, (*b*) 9.87; crude fat (*a*) 0.82, (*b*) 0.25; cellulose (*a*) 0.37, (*b*) 0.32; N-free ext. (starch, dextrin, sugar), (*a*) 60.70, (*b*) 60.96%. E. J. C.

The use of blood for food. F. HOFMEISTER. *Münch. med. Wochschr.* 62, 1106–8, 1146–50(1915).—The important factor in the nutritional value of blood is its protein. The utilization of blood protein, as shown in expts. on animals and man, is quite satisfactory. The proteins of the serum are utilized as well as meat protein, those of the red blood corpuscles less. For several years a bread, "esthnic blood bread," has been made with addition of blood; it has been in use in some parts of Russia. Its dark color prevented its more general introduction. A difficulty is found in that the blood has to be used fresh, as it does not keep well. To overcome this difficulty it is necessary to obtain the blood in powder form. A satisfactory prepn. can be made using defibrinated blood, coagulated by boiling under certain precautions with H_3PO_4. The water is drained off the ppt. by colation and the remaining portion pressed out under high pressure. The residue is driven through a sieve and dried in a thin layer in a current of air at a temp. not exceeding 50°. The mass is easily made into a fine flour. It is insol. in water but disperses easily without swelling. It contains 9.12% H_2O, 13.66% N (= 80% protein), 1.28% ether ext., 2.11% ash. This prepn. can be used for making bread and can be added to various other foods. But it is still colored. The best results were obtained in the following manner: Two-hundred cc. defibrinated blood were heated on the water bath cautiously, to a temp. close to the coagulation temp. (about 65°), then under constant stirring poured into 200 cc. of water containing the necessary amt. of H_3PO_4 and kept boiling until the red color had disappeared. While cooling 3% H_2O_2 was added with stirring until the grayish brown ppt. takes on a clay-yellow color. After standing several hrs., the water was removed in the manner described above. By adding more H_2O_2 and letting it act longer, a nearly white ppt. can be obtained. An excess of H_3PO_4 is to be avoided. The coagulum treated with H_2O_2 keeps better than one not so treated. A prepn. obtained in this manner called "Sanol" contained 13.56% N. It can be used for baking bread, etc. The coagulated blood does not contain those substances which prevent the peculiar nervous symptoms which are

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seen in white mice after 3 weeks' feeding with the finest wheat flour and which are preventable by bran and yeast. "Sanol" could be manufactured on a large scale, so that its price would fall far below that of the cheapest food protein of the present time (cod fish protein). S. AMBERG.

Bread making and butyric ferment in Latium. R. PEROTTI AND U. CRISTOFOLETTI. *Stas. sper. agrar. ital.* **48**, 331; through *Ann. chim. applicata* **4**, 129(1915). —P. and C. isolated *Clostridium butyricum* and *Saccharomyces minor* from the ordinary leaven of Velletri bread, and studied the conditions of nutrition and functioning, and the best means of artificial nutrition. They attribute the good qualities of the Velletri bread to the moderate presence of butyric fermentation in it. S. LEVY.

Nutritive value of wheat flour and of bread in relation to phosphorus fertilizers. G. MASONI. *Stas. sper. agrar. ital.* **48**, 385(1915); through *Ann. chim. applicata* **4**, 129–30.—The total amt. of P, relatively scarce in the finest flour, increases continuously as the grade deteriorates, and still more so in the secondary products, becoming a max. in bran. The complexity of the organic P compds. depends on that of the mineral compds. Phytin predominates, then nuclein, and finally lecithin. The quantities of phytin and lecithin compds. increase with increase of total P. The % of mineral substances and of ether ext. increases from flour to bran. The phytin and nuclein P occurs practically in the same proportions in flour as in bread, allowing for the latter's greater moisture, but the proportion of lecithin P is very much less in bread, probably owing to the ease with which lecithin may be decomposed by temps. above even 60°. M. concludes that wheat flours of inferior quality, *i. e.*, dark flours, and hence the bread made therefrom, have a greater direct and indirect nutritive value than the finer and whiter flours, considering them from the view-point of P compds., and also from that of the common food principles, since the inferior flours also show a greater richness in nitrogenous substances, in crude fat (ether ext.), and in complex mineral substances. S. LEVY.

The character of the water-soluble nitrogen of some common feeding stuffs. E. B. HART AND W. H. BENTLEY. Univ. Wisc. *J. Biol. Chem.* **22**, 477–83(1915).—In the aq. exts. of the feeding stuffs studied, the N not pptd. by Stutzer's method (*J. Landw.* **28**, 103(1880)), was not amide N but consisted largely of the N of free amino acids and of polypeptides. In most cases, these contained from 50 to 75% of the total H_2O-sol. N. The acid-amide N was generally below 10%, almost always below 20% and only in the case of corn stover over 40% of the total H_2O-sol. N. The NH_3-N rarely exceeded 5% of the H_2O-sol. N and in some cases was wholly absent. I. GREENWALD.

The adulteration of bran. O. LOPRIORE. *Stas. sper. agr. ital.* **48**, 297–312(1915). —Adulteration is effected by adding vegetable and mineral substances, *viz.*, peanut shells, rice hulls, corn cobs, vegetable ivory, sawdust, etc. The use of peanut shells is easily noted by the smell of rancid oil and by the microscopic observation of the fibrovascular tissue. Rice hulls are detected by use of the microscope. Sawdust may be detected by letting bran ferment; it develops the odor of acetic acid. Vegetable ivory may be detected by use of the microscope and by the high ash content. The presence of these substances appreciably decreases the food value. Tables show compn. and % digestibility of peanut shells, coffee bran, buckwheat- and rice-hulls. J. A. LECLERC.

Oats substitutes. THESER. *Wiener Landw. Ztg.* **65**, 281(1915).—T. describes 72 different mixts. which have the same content in starch, protein, fat and dry matter as a mixt. of 4 pts. oats to one of straw. Among the components of the substitutes are several kinds of hay and straw, wheat and corn bran, corn, horse beans, malt sprouts, molasses and the press cakes of corn, palm and flax seeds. The composition of each

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of these substances as regards starch, fat, dry material and protein content is also given. C. F. MILLER.

The utilization of total brewery waste for feeding purposes by means of a new preservation process. ULRICH. *Z. öffent. Chem.* 21, 85–90(1915).—The preservation process which is not described is said to be legal and entirely harmless. Numerous analyses of the preserved material are reported. P. B. DUNBAR.

Sea weed as a source of fodder. E. BECKMAN. *Sitzb. kgl. preuss. Akad. Wiss.* 1915, 645–51.—B. gives results of work done on sea weed from the coasts of England, Norway and America. In addition its value as a source of I and salts of K the food value is given. In the analysis of the samples from the various coasts, protein, fat, starch, crude fiber, ash, KCl and I were detd. Similar detns. were made on wood to show the relative values of each. P. J. DONK.

Determination of food value of wood and straw. E. BECKMAN. *Sitzb. kgl. preuss. Akad. Wiss.* 1915, 638–44.—The analysis of several kinds of wood for N, fat, starch and ash was carried out according to the following methods: N, by Kjeldahl, sample 1.5–2 g., factor for protein 6.25. Fat, Soxhlet, ether extn., sample 10–12 g. Starch, digestion under pressure with water at 108–110°, hydrolyzing with 25% HCl, detg. the hydrolyzed substance by Fehling method, sample about 5 g. Ash, slow incineration with gradual heating to low redness to const. wt., in a Pt crucible, sample about 3 g. The compn. of the kinds of wood analyzed are as follows: Protein 1.15–2.04%, fat 0.37–1.35%, starch 0.95–5.90%, ash 0.68–0.91%. The analysis of straw gave reducible substances (calcd. as starch) 26.12%, fat 3.61%, and ash 9.98%. P. J. DONK.

Disintegrated straw for fodder. F. LEHMANN. *Deut. Zuckerind.* 40, 317(1915); *Wochschr. Zentralver. Rübenzuckerind.* 53, 341(1915).—In order to supply the lacking protein disintegrated straw is treated with $(NH_4)_2SO_4$ and Na_3PO_4 and allowed to heat. After this it is inoculated with molds and by their growth the entire mass becomes filled with mycelia, which contain the desired protein so that the material is equivalent to bran. The selection of the most desirable molds is not yet finished. An editorial note warns that this is unaccompanied by analyses or feeding tests, and is to be discounted until such data are furnished. W. L. BADGER.

The splitting of casein by *Streptococcus latis* (BARTHEL) 11C.

DAIRE: **Les microbes dan l'industrie laitière.** Paris: Baillière. 124 pp. 1.50 fr.

TEIXEIRA, G.: **Trattato di chimica applicata alla bromatologia e alla igiene.** 4 a ediz. Terni: 1109 pp. 12 L.

U. S., 1,155,093, Sept. 28. I. PIERER and C. G. LIVINGSTON. **A blended cereal food** is prepd. from oat meal flour 60 and wheat gluten flour, containing 35% protein or more, 40 parts.

U. S., 1,155,530, Oct. 5. A. S. WAHL. **Bread,** after baking, is allowed to cool in an atm. of CO_2 which is absorbed into the pores of the bread and keeps it fresh for a longer time than usual. Volatile flavoring substances such as amyl butyrate may be similarly absorbed into the bread while cooling.

U. S., 1,155,531, Oct. 5. T. B. WALKER. **A stock food** is prepared by treating wood residue (*e. g.*, after extn. of tannin) with about 1–2% of ground malt, heating to 150–60° under pressure with dil. acid for 1–2 hrs. to hydrolyze the cellulose in the mixt., neutralizing with alkali, evapg. to a sirup after sepg. from residual insol. matter and mixing with cottonseed meal and molasses.

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U. S., 1,155,555, Oct. 5. A. O. EDWARDS. **Pickling cantaloups.** Small unripened cantaloups are soaked in a 20% NaCl soln. for 24 hrs., transferred to a 50% NaCl soln. and, after another 24 hrs., again transferred to clear H_2O in which they are also allowed to remain 24 hrs. Then they are treated with vinegar and exposed to sunlight in a glass receptacle for about 24 hrs. to restore their natural color.

U. S., 1,155,743, Oct. 5. G. P. LEHRITTER. **A jelly-like food** is prepared by mixing 32 parts of clam ext. (prepd. by steeping clams after grinding in their own liquor) freed from solid matter, with NaCl 2 and arrow-root 1 part, and sterilizing and concg. by boiling.

U. S., 1,157,976, Oct. 26. A. J. DAVIS. **Pasteurizing milk.** After pasteurization, while still at the pasteurizing temp. and without any intermediate treatment, the milk is filled into receptacles also heated to pasteurizing temp., sealed and maintained at this temp. for some time and then cooled.

U. S., 1,158,261, Oct. 26. E. MONTI. **Fruit juices** are concd. and clarified by cooling the juice (*e. g.*, from berries) to near the congealing point in tanks while satg. it with air, drawing off the clarified juice from the sediment and allowing it to stand for some time, slowly passing it through a counter-current of sterilized air, preferably also in contact with wood shavings, filtering and gradually warming to 50° or a somewhat lower temp., storing the juice at this high temp. for some time and then repeating the process.

U. S., 1,158,275, Oct. 26. P. M. PHILLIPS. **Graduated bottle for use in Babcock milk testing apparatus, etc.**

U. S., 1,158,297, Oct. 26. H. H. ROOT. **A food mixture** formed of honey 2 and ground peanuts 1 part.

Brit., 14,671, June 18, 1914. T. BOBERG, O. SÖDERLUND, F. ASLUND AND TECHNO-CHEM. LABORATORIES, LTD. **Food products,** such as exts. of meat or coffee, are reduced nearly to dryness and formed into granules, etc., which are heated to incipient fusion, *e. g.*, to 90°, and then subjected to a sudden reduction of pressure, whereby a dry, porous product is obtained. The final treatment may take place in a rotary heater, to obtain the product in a smooth and regular form.

Ger., 283,988, Aug. 5, 1913. R. GÄBEL. App. for **refining chocolate** and like material, comprizing a number of rolls arranged next to each other, and ring members, lying thereon, with quadratic cross-section, and rotating against one another, continuously or intermittently, dependent upon the changing direction of rotation of the rolls.

14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

Report on water. W. W. SKINNER. *J. Assoc. Off. Agr. Chem.* 1, 97–9(1915).—Study of methods for Sr, I, and Br gave results which were generally satisfactory, but it is considered unwise to recommend the methods for adoption as official until further work has been done. W. H. FRY.

Estimation of carbon dioxide in common natural waters. ALFREDO CAVAZZI. *Ann. chim. applicata* 4, 81–91(1915).—The method consists in liberating all the CO_2 of a water under examn. by addn. of dil. H_2SO_4, warming, absorbing the CO_2 set free in an ammoniacal soln. of $CaCl_2$, and detg. the quantity of $CaCO_3$, with titrated solns. of HCl. The $CaCl_2$ soln. is made by dissolving 2.5 g. fused $CaCl_2$ in 40 cc. boiling H_2O in a flask to which are added 20 cc. concd. NH_4OH, then loosely stoppering the flask (rubber stoppers are used throughout), and keeping the soln. near the b. p. for

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45 min. The soln., always more or less turbid, is poured warm on a filter, and the filtrate collected in a flask of slightly over 60 cc. capacity; the flask is quickly closed tightly and the liquid allowed to cool. In 1 l. H_2O dissolve 20 g. dry NaOH to form approx. a 0.5 *N* soln. In a 500 cc. flask add enough H_2O to 25 cc. fuming HCl to make exact vol. Titrate 20 cc. of this soln. with the NaOH soln. (Me orange is used in all titrations); the result indicates the quantity of H_2O to be added to the remaining 480 cc. to make approx. a 0.5 *N* soln. Then det. exactly the number of cc. of the NaOH soln. to neutralize 30 cc. of the HCl soln. Into a beaker contg. exactly 0.5 g. pure, dry, pptd. $CaCO_3$ add 30 cc. of the HCl soln.; when the $CaCO_3$ is dissolved, titrate with the NaOH soln. If 30.1 cc. NaOH soln. neutralized 30 cc. HCl soln. and 9.95 cc. NaOH soln. was necessary to neutralize the excess of HCl which dissolved the $CaCO_3$, then 20.15 cc. HCl soln. were equiv. to 0.5 g. $CaCO_3$, and this ratio is used in calcn. in the actual analysis. The app. consists of a 2 l. Erlenmeyer flask as generator, connected by a slightly downwardly inclined tube about 50 cc. long, then a vertical tube about 60 cc. long, to a 150–200 cc. Erlenmeyer flask used as a collector and contg. the ammoniacal $CaCl_2$ soln. The vertical tube extends through the stopper to within $^1/_2$ inch of the bottom of the flask, which rests in a dish contg. 3.4 l. cold H_2O. By an upper lateral tubulure, the collector is joined with 2 U-tubes each contg. about 8–10 cc. of the same $CaCl_2$ soln. in the bends, the inner U-tube to catch the last traces of CO_2 and the outer U-tube to act as a check on the CO_2 of the outer air. Before filling the generator with the water to be analyzed, and the collector with the $CaCl_2$ soln., there should be passed into these vessels air that has gone through solid NaOH-CaO, and then through 50% KOH soln. to remove CO_2 which would introduce considerable error into the results. The H_2O to be analyzed should be taken at the spring or source in large, rubber-stoppered bottles into which CO_2-free air has been previously passed. The completely filled bottles should stand in cold H_2O for about an hr. before opening. The collector is file-marked at the neck, the capacity up to this mark having previously been detd. The sample H_2O is siphoned into this flask to the mark, 150 cc. of it removed by a pipet, some small pieces of pumice-stone dropped in, 15 cc. cold 1:3 H_2SO_4 added, and the flask stoppered, all these operations being done as quickly as possible. The flask is now warmed, preferably by a ring burner, which is regulated as fully as possible, but so that not more than 30–35 bubbles of gas pass through the collector per min. Care should be taken towards the end when near the b. p. of the liquid to lower the flame sufficiently to produce only a gentle boiling, which is continued for about 30 min., increasing the flame at the end of the period to give stronger ebullition, till no more bubbles come over. The condensed H_2O should reach a blue pencil mark on the outside of the collector indicating a vol. of 130–140 cc. The boiling is continued still stronger for 3–4 min. The whole operation should last at least $1^3/_4$ hrs., and if properly conducted only traces of $(NH_4)_2CO_3$ should pass over into the 1st $CaCl_2$ U-tube. The upright tube is now disconnected from the horizontal tube, the gas extinguished, the side tubulure of the collector stoppered, the upright tube and its stopper removed and the adhering $CaCO_3$ scrubbed and washed off into a beaker and then into the collector, into which also is poured the liquid and washings from the 1st $CaCl_2$ U-tube. Then stoppering the collector lightly, it is placed for 45 min. on a boiling salt bath, stoppered tightly and allowed to cool. If, preferably, this is done in the morning, in the afternoon the liquid should be poured on a medium 9 cm. filter, the filter washed 4 times with cold H_2O, using 20 cc. each time and rinsing over the $CaCO_3$ on the walls of the collector, then 11 times with cold H_2O contg. 10% concd. NH_4OH, the last portions being 1st used to carry to the filter the $CaCO_3$ on the walls of the collector. The filter is dried in a beaker in a H_2O oven for $1^1/_2$ hrs., then about 2 cc. of 50 cc. of the titrated HCl in a buret allowed to drop into the dried collector, and the remaining 48 cc. poured over the filter in the beaker immediately on removing from

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the oven. The HCl in the collector, after addn. of a little H_2O, is employed to dissolve the traces of $CaCO_3$ that still adhere to the glass, the liquid poured into the beaker, as also the 3 or 4 rinsings of H_2O that are necessary to take out all the HCl. The excess of HCl is titrated with the NaOH soln., and the CO_2 in the original H_2O calcd. as indicated before. The method may be modified to det. combined CO_2: 2 l. of the sample H_2O are poured into a flask, 1 g. hydrated $CaSO_4$ or pure finely powdered selenite are added, and 0.1–0.2 g. NaCl, the flask well stoppered, and shaken to soln. of the powder. Then the whole is evapd. in a $^1/_2$ l. porcelain dish 1st over the free flame and then on a salt bath nearly to dryness. On cooling, 50 cc. of the titrated HCl are added from a buret, the residue dissolved as completely as may be, the whole filtered and washed through a small filter, and the filtrate titrated with NaOH. A very slight error will be introduced here by partial decompn. of $CaCO_3$ during evapn., if dissolved SiO_2 is present in the H_2O. To det. directly the sum of free and semi-combined CO_2, proceed as in the regular method, but using 1.5 g. hydrated $CaSO_4$ instead of the H_2SO_4, and continue the gentle boiling for a longer time, so that the whole operation should take about $2^1/_2$ hrs. According to C., the advantages of his method are simplicity of operation and app., possibility and ease of employing large quantities of H_2O, certainty of good results. S. Levy.

Estimation of total hardness of water by Blacher's method. Hanns Fischer. *Z. öffent. Chem.* **20**, 377–81(1914); *J. Chem. Soc.* **108**, II, 374; cf. *C. A.* **7**, 1394.—This method was found to be trustworthy but it is recommended that a correction be applied when the H_2O under exam. contains appreciable amts. of Fe or Mn. One mg. per l. of Fe or Mn is equiv. to 1 p. p. m. hardness (as $CaCO_3$). H. A. Lepper.

Disturbing influence of colloids in hardness determinations according to Clark. J. D. Ruijs. *Chem. Weekblad* **11**, 599–602(1914).—An address delivered before the Delft Natuurwetenschappelijk Gezelschap, in which it is pointed out that the Clark method gives decidedly low results in the presence of colloids. G. W. Morey.

Lead-dissolving power of water in drinking water conduits of Enschede. J. Rodenberg. *Chem. Weekblad* **12**, 494–7(1915).—The H_2O used is a moor H_2O containing much Fe. The Fe was formerly removed by a pptn. method, but is now removed by aeration. Changing the purification method resulted in a smaller solvent power for Pb, due to a diminution in the free CO_2 content of the water. G. W. M.

Detection of nitrous acid in drinking water. L. Rosenthaler and V. Jahn. *Apoth. Ztg.* **30**, 265–6(1915).—As the result of tests with the more common reagents, it was found that indole as applied by Dane (*C. A.* **5**, 2379) gave the most satisfactory results. W. O. E.

Colloidal and catalytic properties of mineral waters of Roumania. Complications due to the presence of salts. E. Giurgea. *Bull. acad. sci. Roumanie* **2**, 192–201 (1914); *J. Chem. Soc.* **108**, II, 330(1915).—The colloidal and catalytic properties of several spring waters containing S compds. and carbonates are expressed by a number termed the "catalytic coefficient." This is detd. by measuring the quantity of H_2O_2 destroyed by a measured quantity of the water at 37° in 1 hr. The elec. cond. of the same water is also given, and it is shown that the colloidal properties, as measured by the "catalytic coeff.," are not directly related to the cond. F. W. Smither.

Changes in mineral waters on standing in metallic vessels. Emil Giurgea. *Bull. acad. sci. Roumanie* **2**, 303–10(1914); *Chem. Zentr.* **1915**, II, 47.—G. described the destructive action of the concd. mineral waters of Roumania on pipes, and the natural changes which the waters undergo in this process. Stoneware or enamelled clay pipes are recommended in cases where the water is to stand for long periods. The waters retain their conductivity, and therefore their mineral content unchanged for

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months in such vessels. "Tombac" or Al pipes are to be used for domestic plumbing.
E. B. MILLARD.

A simple colloid-chemical process for removing microörganisms from surface water in relation to the supply of drinking water in the field. M. STRELL. *Münch. med. Wochschr.* 62, 1158–9(1915).—Humin (Wellensick, Hannover) is prepd. from brown coal by treatment with hot NaOH. It is a black doughy mass giving a colloidal soln. with water. When humin is added to polluted water and this mixt. is treated with the soln. of a metal salt like $FeCl_3$, etc., a flocculent ppt. is formed containing finely suspended substances like microörganisms, dyes, native proteins, etc. River water containing 84,960 bacteria per cc. was treated with humin soln. and then $Al_2(SO_4)_3$ soln. was added. After sedimentation the supernatant fluid was filtered to remove the suspended finer particles; the filtrate contained 4–8 bacteria per cc. By a repetition of the process all the bacteria could be removed. In these expts. 5 cc. 10% humin soln. were added to one l. water and then 2.5 cc. 10% $Al_2(SO_4)_3$ soln. The filtration is necessary because the process simply leads to an inclusion of the bacteria; it does not kill them. For the filtration Canton flannel is recommended. The filtrate contains very little $Al_2(SO_4)_3$ and the taste is good.
S. AMBERG.

The water supply of soldiers in the field. CHRISTIAN. *Das Wasser* 1915, 135–40; *Wasser u. Abwasser* 9, 539–40(1915).—Barrels with perforated bottoms containing a layer of stone, sand or ashes serve for the removal of suspended clay, algae or protozoa. Alum may be employed to facilitate sedimentation. If a supply is suspicious its use is prohibited. Portable filters and sterilizers accompany the troops. Each of these portable filters furnishes from 800 to 900 l. of sterile water in 1 hr. Halogen compds. serve for the sterilization of the water supply of the individual soldier. Antiformin and bleach may be used. The French sterilize water by the aid of ultraviolet rays. The efficiency of this process is greatly impaired by turbidity. Berkefeld filters are employed to advantage. A portable outfit with 7 candles can furnish 2000 l. per hour.
ARTHUR LEDERER.

The present state of refuse incineration and recovery. E. H. STECK. *Feuerungstechnik* 3, 281–5(1915).—Several furnaces and installations for the incineration and recovery of by-products of refuse are described with detailed drawings. The growth of the practice of incinerating refuse and the improvements of furnace construction are reviewed. It is stated that rich refuse may be used as fuel for steam production, and the poorer materials may be burned and the residue melted for the production of artificial stone.
H. R. GUNDLACH.

Further experiments in the destruction of fly larvae in horse manure. F. C. COOK, R. H. HUTCHISON AND F. M. SCALES. U. S. Dept. Agr., *Bull.* 245, 22 pp.(1915); cf. *C. A.* 9, 1359.—The larvicidal effect was investigated of arsenical dip, $CaOCl_2$, $MgSO_4$, lime-sulfur, H_2SO_4, $PhNH_2$, β-$C_{10}H_7OH$, cresylic acid, p-$Cl_2C_6H_4$, HCHO, $PhNO_2$, $H_2C_2O_4$, C_5H_5N and a number of plant materials. The effects of these substances on the fertilizing value of manure and on plants were studied by chem. and bacteriological analyses and by field tests. Most of those which are effective and not injurious are too expensive to be practicable. Hellebore is recommended as superior to the above materials and it has the advantage over borax, which was recommended in the previous bulletin, that it is not injurious to plants when applied in any amt. It is a little more expensive than borax.
E. H.

The air of Bucharest. ST. MINOVICI AND E. GROZEA. *Bull. acad. sci. Roumanie* 2, 275–86(1914); *J. Chem. Soc.* 108, II, 334(1915).—M. and G. report a large number of detns. of the amts. of dust, CO_2, and O_2 present in the air of Bucharest. The analyses of the dust were made from air at a height of 1.5 m. from the pavement. Thirty analyses

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showed the following mean quantities per cu. m.: in streets paved with asphalt, 0.0062 g.; in streets paved with stone blocks, 0.0066 g.; in earth-paved country roads, 0.0534 g. These results are compared with similar results obtained in Berlin and Dresden. Microscopic examn. with dust deposits from the same sources shows that the country roads give a dust containing a large quantity of angular particles; that from asphalt-paved roads contains a quantity of org. fibers. The av. of more than 100 detns. shows 3.02 parts per 10,000 of CO_2 for the city itself, and 2.81 per 10,000 for the surrounding plain. Out of 95 qual. tests made between June and Dec., 1914, for the presence of O_3, 48 gave positive results. Hence, apart from the large quantity of dust, the air of Bucharest compares very favorably with that of other large European towns.

F. W. SMITHER.

Corrosion of iron and steel (BINNIE) 9. Determination of gases dissolved in waters and effluents (SWANSON) 7. The hydrant water of Munich (REICHARD) 16. Dust in mine air and the causation of miners' phthisis (MOIR) 11G. Determination of combustible gases in mineral waters (HAUSER) 1. Plankton development in the Lietzen Sea (KOLKWITZ) 11D.

HUTTON, W.: **Country Plumbing Practice: Design, Installation and Repair of Systems of Water Supply and Sewage Disposal.** New York: D. Williams Co. 310 pp. $2.00.

U. S., 1,154,925, Sept. 28. A. S. HOROVITZ. **A disinfecting composition** is prepd. from green K soap 45, CH_3O soln. 41 and alc. 13.5 parts, with lavender oil or other perfume 0.5 part.

U. S., 1,156,947–8, Oct. 19. M. VON RECKLINGHAUSEN. **Apparatus for sterilizing liquids by the action of ultraviolet rays.**

U. S., 1,158,225–6, Oct. 26. W. M. JEWELL. **Method and apparatus for mixing water with purifying chemicals** and settling and filtering it.

Ger., 284,635, Sept. 12, 1912. R. GANS. **Removing oxygen from water for** domestic and industrial purposes.

Brit., 13,525, June 3, 1914. J. QUIRK. App. **for softening water, applicable in** connection with a domestic cistern, comprizes a device for dividing the H_2O as it passes to the cistern into 2 parts, 1 of which is led to a softening tank and then mixed with the other part, the mixt. being passed through a filter into the cistern.

Brit., 13,690, June 5, 1914. A. LING, H. B. WOOLDRIDGE and R. STEWART. **Sterilizing receptacles of wood or cellulose pulp,** etc., such as casks, beer vats, etc., for food and beverages, and pulp for filtering beer, by treating them with H_2O_2. In treating casks, the interior is preferably first warmed by means of steam.

Brit., 14,290, June 13, 1914. E. L. MILLER. **A water filter.**

Brit., 14,615, June 18, 1914. J. BROMET, F. THORMAN and H. C. WOOD. App. **for drying sewage sludge.**

Brit., 14,807, June 19, 1914. R. BASSETT and J. H. STAPLES. Construction and operation of an app. **for the distillation of water.**

Ger., 283,677, Aug. 12, 1913. SIEMENS & HALSKE AKT.-GES. Process and app. for **detecting the presence of mine gases** in the air, dependent upon the variation of the heat cond. of the air due to the presence of the admixed gas, with the employment of a gas for comparison. The gas for comparison is obtained from the air under examn. by passing it through a catalyzer or an oxidizing agent. The sketch illustrates a suitable device. The gas under examn. enters the app., through a dust filter, at the open-

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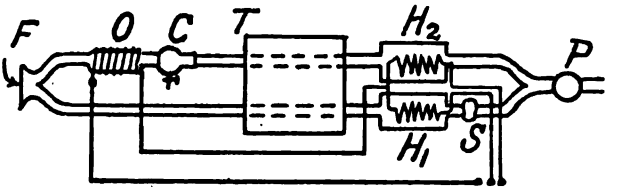
ing *F*, divides into 2 streams, of which one flows directly through the temp. equalizer *T* to the wire heating system H_1, while the other passes through the oxidizing furnace *O*, the equalizer *T*, and the 2nd wire heating system H_2. *S* represents a resistance for equalizing the rate of flow of the two currents of gas, and *P* is a suction pump. The oxidizing chamber *O* is in the form of a small elec. furnace of suitable design, in which the catalyzer or the oxidizing agent is contained. Behind the furnace is arranged the drying device *C* for removing the H_2O resulting from the oxidation; it consists of a glass bulb with a cock to draw off H_2O, and a $CaCl_2$ tube connected thereto. The heating current for the furnace *O* and the heating wires is supplied through a three-wire cable. The wire heating systems H_1 and H_2 form the 2 branches of a Wheatstone bridge, or they can be connected with a differential galvanometer whose scale indicates the % of CH_4 in the gas. The temp. equalizer *T* consists of a Cu block with 2 crossing tube systems, each of which is traversed by one of the gas currents.

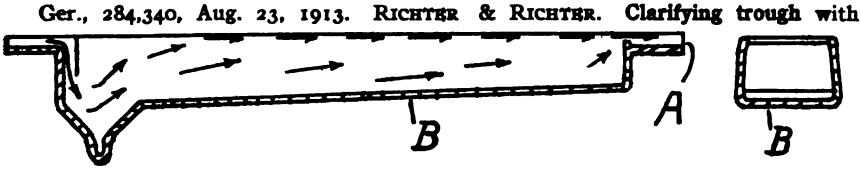


Ger., 283,762, Nov. 19, 1912. ERSTE SÜDDEUTSCHE MANOMETERBAU-ANSTALT UND FEDERTRIEBWERKFABRIK J. C. ECKARDT. App. for **the automatic testing of water-purifying plants,** wherein the H_2O to be tested is brought into reaction with the testing agent, with the aid of suction, into glass testing vessels.

Ger., 284,223, Sept. 2, 1913. O. VOLLMER. In a process of **removing iron and manganese from water,** as specified in 283,155 (*C. A.* 9, 2415) the chamber above the filter carrying the algae is maintained under vacuum, since the algae are more active under reduced pressure. As a result the rate of flow may be increased.

Ger., 284,224, Sept. 2, 1913. Addition to 283,155 (*C. A.* 9, 2415). O. VOLLMER. **In the parent process of removing iron and manganese from water** by passing it through a filter upon which algae have been deposited, the adhesion of the algae to the members of the filter interferes with an intimate contact of the water with the full surface of the leaves. To avoid this the H_2O is broken up into a number of small streams in order to allow the algae to be free in the stream.

Ger., 284,340, Aug. 23, 1913. RICHTER & RICHTER. **Clarifying trough** with



cross-section widening from the surface of the H_2O to the bottom, the bottom *B* rizing gradually towards the overflow *A*.

Ger., 284,350, Oct. 24, 1912. P. KROPP. App. for **purifying back waters** and drinking water, wherein the H_2O, before entering the clarifying chamber, is broken up into drops and conducted into the chamber through a restricted opening about midway between the surface of the H_2O and the sludge outlet.

15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

Probable combination of the chlorine ions in alkali salts. R. F. HARE. New Mexico Expt. Sta., *Bull.* 95, 3–6(1915).—Expts. indicate that heating the residue of

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chlorides from a water or soil soln. at a low red heat for 10 minutes might furnish a method for detg. the Cl in combination with Mg in mixed alkali salts, the loss in Cl representing the amt. in combination with Mg. By heating $MgCl_2$ alone for 10 minutes at a low red heat it loses 95.65% of its Cl; $CaCl_2$ loses 6.19% and NaCl 4.01%.
R. C. ROARK.

A review and discussion of some of the methods for the determination of alkali in soils. R. F. HARE. New Mexico Expt. Sta., *Bull.* 95, 7–16(1915).—A comparison of results obtained for black alkali in soils by 3 diff. methods is presented in tabular form; the methods are the New Mexico, modified Calif. and modified Arizona. Largely a discussion. R. C. ROARK.

New methods of measuring concentration of soil solutions around the soil particles. G. BOUYOUCOS AND M. M. MCCOOL. *Science* 42, 507–8(1915).—F. ps. of different soils with varying amts. of moisture were detd. by the ordinary f. p. method. Solidification started when the mass was supercooled only 0.2°. The method may be used with very low moisture content. Lowering of f. p. and concn. of soln. vary directly with the amt. of H_2O present. F. p. detns. of nutrient soln. alone and with different soils showed that the lowering of f. p. of solns. with soil varies little from that of solns. alone.
R. O. E. D.

Report on soils. G. S. FRAPS. *J. Assoc. Off. Agr. Chem.* 1, 33–9(1915).—There is more variation in the results secured by the lime-water method for soil acidity than is desirable, but the method is useful in distinguishing soils which are acid and in showing in a general way their lime requirements. A clear humus filtrate may be obtained by the method of transferring soil to filter (cf. *C. A.* 7, 854) but the filtrate contains colloidal mineral matter which is pptd. by $(NH_4)_2CO_3$. It is believed that the removal of lime by washing on a filter under a filter disk, the removal of acid by washing with successive portions of carbonated water in a closed bottle or cylinder, the subsequent extn. of the humus by the official method, and the completion by $(NH_4)_2CO_3$ and repptn. would form a satisfactory method for humus. The method of White gave unsatisfactory results. It is believed that a method for humus in which there is only a single extn. with acid would not be satisfactory. It should, however, be possible to devize one with 2 extns. which should be sufficient, provided that the first extn. took out almost all the lime. It is recommended that the Rather modification of the method for humus be adopted as official. W. H. FRY.

Humus determinations. O. C. SMITH. *J. Assoc. Off. Agr. Chem.* 1, 46–8(1915).—For a certain soil, the official and original Rather methods are wholly inadequate and the modified Rather method introduces too many doubtful factors. W. H. FRY.

Report on nitrogenous compounds in soils. J. K. PLUMMER. *J. Assoc. Off. Agr. Chem.* 1, 49–54(1915).—Lime is the best agent known for the clarification of soil exts. in which nitrate detns. are to be made. The absorptive power of the Chamberland-Pasteur filter tube would tend to debar this app. for such work. The amt. of CaO necessary for removal of clay varies in different soils, but 2 g. is about all that is needed for 100 g. of most loam soils. The Chamot modification, except in 2 instances, gave higher results than the Gill method on the soil alone, and in every case where KNO_3 was added. Agreement was remarkably close when CaO was used. Use of Al cream is questionable. W. H. FRY.

Potassium from the soil. E. W. HILGARD. Univ. Cal. *Science* 42, 527–8 (1915).—H. reviews and criticizes the work of Hopkins and Aumer (cf. *C. A.* 9, 2416) and calls attention to the work of Loughridge (*Am. J. Sci.* (1873)), wherein it was shown that only one-half of the total K extd. by HCl (d. 1.115) was obtained during the first 24 hrs., and 5 days were required for complete extn. Notwithstanding this demon-

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stration the Assoc. of Official Agr. Chemists adopted a 10-hr. digestion. It is suggested that expts. be made by growing plants on the residue from a digestion carried to the limit of acid solubility. L. W. RIGGS.

Differences in lime requirement as indicated by the Veitch method. A. W. BLAIR AND H. C. MCLEAN. *J. Assoc. Off. Agr. Chem.* 1, 39–43(1915).—Extreme accuracy cannot be claimed for this method. Results of plot expts. do, however, seem to make it certain that the method may be depended upon to show differences in lime treatment within reasonable limits and that it may be used as a safe guide in detg. the amt. of lime to be applied for different crops. W. H. FRY.

Physico-chemical soil investigation. III. Moisture relations of the soil and vegetation. U. PRATOLONGO. *Stas. sper. agr. ital.* 48, 44–55(1915).—Expts. carried on with oats, wheat, vetch, mustard, and flax showed that there exists a relation between the water content of soils and the beginning of plant growth. The various plants show no appreciable differences in behavior during the drying of the soil. Cf. following abstr. J. A. LECLERC.

Physico-chemical studies on soil. IV. Causes of fixation of phosphoric acid by soil. U. PRATOLONGO. *Stas. sper. agr. ital.* 48, 456(1915); through *Ann. chim. applicata* 4, 130–1; (cf. preceding abstr.).—The phenomenon of H_3PO_4 fixation by the soil, considered from a general viewpoint, is the result of various reactions, their relations or the prevalence of one or the other in the complex process depending on the exptl. conditions under which the phenomenon, which may be assumed to be one of absorption, is carried out. This fact is demonstrated by the nature of the relations which connect the quantity of H_3PO_4 absorbed to the final concn. of the solns., by the behavior of the absorbed H_3PO_4 in respect to redissoln., and by the kinetic study of the process. If a soil free of limestone comes into contact with a soln. of a monometallic phosphate, the H_3PO_4 so fixed combines in the soil to form compds. of absorption with the electropositive colloids of the soil, hence with the hydroxides of Fe, Al, and Mn. If limestone is present in the soil, a fixation of H_3PO_4 as Ca phosphate takes place. On account of the different velocities with which these processes react, it will happen, if the time of contact between soil and soln. is short enough and the soil is in great excess with respect to the H_3PO_4, conditions which occur in practice, that the 2nd process of fixation will have only a limited and negligible importance, compared with the predominance of the 1st process. If the soil comes into contact with solns. of bimetallic alk. phosphates, then besides the previous absorption process, there will occur a secondary fixation, *i. e.*, an exchange of metals between soil and soln., with sepn. of $CaHPO_4$ and $MgHPO_4$. Under these conditions the H_3PO_4 behaves like H_2CO_3, H_2SO_4, H_3AsO_4, uric acid, etc. S. LEVY.

The effect of some organic soil constituents upon nitrogen fixation by Azotobacter. HOWARD S. REED AND BRUCE WILLIAMS. Va. Agr. Expt. Sta., *Tech. Bull.* 4, 81–95 (1915); see *C. A.* 9, 2417. R. C. ROARK.

Nitrogen fixation and nitrification in various soil types. HOWARD S. REED AND BRUCE WILLIAMS. Va. Agr. Expt. Sta., *Tech. Bull.* 3, 59–80(1915).—Of 93 Va. soils studied, the cultivated soils showed decidedly higher nitrifying qualities than virgin soils. In virgin soils, the nitrifying power in the light open sandy soils was strikingly low, in the loams and clay loams it reached its max., and in the heavy clays there was again depression. The high nitrifying power of certain cultivated soils irrespective of texture suggests that this power may be largely increased by proper cultivation. From the results of this investigation it is unwarranted to conclude that soils with high nitrifying power would exhibit also unusual qualities for free N fixation or *vice versa*. Some soils which failed to nitrify $(NH_4)_2SO_4$ in 6 weeks accumulated quite significant amts. of nitrate from their own organic N in 6 months. On the other hand, there were

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some which nitrified the inorg. medium and failed to accumulate nitrates. There appeared to be no relationship between the ability of a soil to nitrify the 2 types of media. Sand failed to stimulate nitrate formation in clay soils, while lime enormously increased its formation. The general indications from fixation studies which the authors have carried on are that, with the possible exception of lime, the humus content of a soil and its cultivation are the only factors which materially affect fixation. Fertilizers, with the exception of CaO, failed to materially increase the nitrifying power of soils. R. C. ROARK.

Technical application of microörganisms to agriculture. C. E. MARSHALL. *Science* 42, 257–64(1915).—Correction to page numbers given in abstract in *C. A.* 9, 2788. E. J. C.

The effect of association of legumes and non-legumes. W. B. ELLETT, H. H. HILL AND W. G. HARRIS. Va. Agr. Expt. Sta., *Tech. Bull.* 1, 28–36(1915).—With Kentucky blue-grass and white clover grown in the greenhouse no direct benefit was shown by their association, or being adjacent. No increase in protein was shown by the association of timothy and red clover during the 1st year. Growing corn and beans in the greenhouse together benefited the corn. Immature plants have higher percentages of protein than the more mature ones. The question of whether a legume benefits a non-legume under field conditions is still an open one. The authors believe that the soil moisture and N factors exert more influence than could be derived from the association of a legume with a non-legume. A content of 0.4% N in a soil from a field that had remained in blue-grass and white clover for over fifty years indicates that the association of white clover with blue-grass on the grazing lands of Va. may be indirectly responsible for the high protein content of blue-grass. R. C. ROARK.

A report on the Piedmont soils. Particularly with reference to their nature, plant food requirements and adaptability to different crops. C. B. WILLIAMS, *et al.* N. Car. Dept. Agr., *Bull.* 36 [2], whole no. 206, 5–121(1915).—A detailed report, giving analyses and results of field expts. on different types of soils of this section. R. C. R.

The determination of the availability of potash in feldspathic fertilizers by means of pot experiments. M. F. MILLER AND E. E. VANATTA. *J. Assoc. Off. Agr. Chem.* 1, 26–8(1915).—Pot expts. with $NaNO_3$ + dried blood + acid phosphate with (1) KCl, (2) K_2SO_4, and (3) varying amts. of feldspar show greater av. relative wt. of crop for the K_2SO_4 mixt. W. H. FRY.

The perchlorate and gravimetric cobalti-nitrite methods for the determination of potash. T. D. JARRELL. *J. Assoc. Off. Agr. Chem.* 1, 29–32(1915).—Results indicate that $KClO_4$ is slightly sol. in alc. wash and therefore this method gives lower results than the Pt method. $BaCl_2$ is only slightly sol. in 95% alc. J. believes that the gravimetric cobalti-nitrite method for detg. K_2O in fertilizers must be greatly improved before it can be successfully used. W. H. FRY.

Report on phosphoric acid. A. J. PATTEN AND L. S. WALKER. *J. Assoc. Off. Agr. Chem.* 1, 8–17(1915).—Results of several collaborators on methods of detg. P_2O_5 in basic slag are reported, and recommendations for further work are given. W. H. FRY.

Report on nitrogen. C. L. HARE. *J. Assoc. Off. Agr. Chem.* 1, 17–22(1915). —Results of several collaborators on detn. of N in various states are reported. It is recommended that the $FeSO_4$-Zn-soda method be provisionally adopted. W. H. F.

Report on determination of potash. H. B. MCDONNELL. *J. Assoc. Off. Agr. Chem.* 1, 22–24(1915).—It is recommended that further coöperation be secured in testing: (1) the use of denatured alc. for washing K_2PtCl_6, (2) the necessity or otherwise for the use of HCl in the aq. ext. in K_2O detns. W. H. FRY.

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Report on availability of potash. E. E. VANATTA. *J. Assoc. Off. Agr. Chem.* 1, 24–6(1915).—Manure in combination with soil decreases the amt. of water-sol. K_2O and the moistened mixt. seems to retain much more of the K_2O than does the dry mixt. Further study is recommended. W. H. FRY.

Report of committee on availability of phosphoric acid in basic slag. C. B. WILLIAMS. *J. Assoc. Off. Agr. Chem.* 1, 102–7(1915).—Source, fineness, and compn. of material, and directions for pot expts. are given. W. H. FRY.

Fermented molasses as source of nitrogenous and potassic fertilizers. A. AITA. *Italia agricola* 52, 54–7(1915).—Sugar beets yield an average of 4% molasses, containing 1.5% N and 5% K_2O. J. A. LECLERC.

Certain factors which influence the fertilizing effect of the slightly soluble phosphates. H. G. SÖDERBAUM. *Kgl. Landtbruks-Akad. Handlingar och Tidskrift* 54, 448–77(1915).—The influence of CaO upon the slightly sol. phosphates (*e. g.*, $Ca_3(PO_4)_2$, bone meal, etc.) was reported from the Kgl. Landtbruks-Akad. Feilds Nos. 75 and 78 in 1903. These expts. showed that whereas the addition of CaO to the readily sol. phosphates had no marked effect upon their ability to increase the crops, the addition of the CaO to the less sol. phosphates inhibited their action. Where the CaO in the soil is low, either type of phosphate (as bone meal or superphosphate) may be used to advantage, but with a high CaO content the insol. phosphates give no desirable results. The expts. now published are a continuation of the series on the influence of N and Mg. The plants used were oats, barley, rye, and wheat; they were grown in pots of soil poor in both P and N. The phosphates used were superphosphate, Thomas slag, Ca_2HPO_4, bone meal, Algier phosphate and apatite. N was added as Chili saltpeter, $(NH_4)_2SO_4$ and org. N. With superphosphates the $(NH_4)_2SO_4$ gave a larger yield than the $NaNO_3$ but with $Ca_3(PO_4)_2$ this was reversed. These results varied with the plants, wheat being more sensitive than the others to these influences. In using Ca_2HPO_4 there is little choice between the two N compounds. With the less sol. types of phosphates, on the other hand, $(NH_4)_2SO_4$ proved superior to $NaNO_3$. Similar results are recorded for org. N; barley, however, is an exception to the above in that NH_3 and org. N always give a poorer crop than $NaNO_3$, regardless of the type of phosphate with which they are administered. When $MgSO_4$ was added with the readily sol. forms of phosphates to the pots the effect on the growth of the plants due to the Mg was slight if any at all and was independent of the forms of N used. The tendency which could be noted was adverse. On the other hand the addition of $MgCO_3$ together with $(NH_4)_2SO_4$ to such phosphates was followed by a distinctly increased yield. With the insol. phosphates $MgSO_4$ gave slight and conflicting results, and $MgCO_3$ varied with the plant, increasing the yield of rye and wheat and slightly decreasing that of barley and oats. A. R. ROSE.

The comparative value of different sources of phosphorus. BURT L. HARTWELL AND S. C. DAMON. Rhode Island Agr. Expt. Sta., *Bull.* 163, 515–60(1915).—This bull. contains the details of the unpublished results and a summary of the published results secured in all the field expts. with diff. sources of P conducted at this station previous to 1914. In a 6-year comparison of Chincha and Lobos guanos, ground bone and dissolved phosphate rock the yield of crops from plots treated with these substances was 8747, 9094 and 8420 lbs., resp. In Expt. II Thomas slag phosphate, Lobos guano, ground bone and dissolved phosphate rock were compared for 7 years on an equal P basis in the presence of liberal amts. of N and K, with the hope that the natural supply of P would prove so deficient that this element would control the growth. No definite conclusions can be drawn from this expt. Twenty yrs. were devoted to Expt. III for the purpose of detg. the relative availability of equal amts. of P in 9 different phosphates applied during the first half of the expt. with liberal amts. of $NaNO_3$ and KCl to limed

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and unlimed land. During the last half only N and K were applied in order that the after-effects of the different sources of P might be studied. On the basis of equal amts. of P on the plots, the most available P in both limed and unlimed soil was apparently that in Thomas slag phosphate, ground bone and dissolved bone. Dissolved boneblack and dissolved phosphate rock ranked next and were considerably superior to raw phosphate rock. The after-effects of the phosphates are striking and show the importance of continued tenure of the land. They left the rank of the different phosphates practically unchanged in case of the unlimed plots, the main change with the limed plots being that the dissolved boneblack was placed among those of first rank.
R. C. ROARK.

The effect of green manuring on soil nitrates under greenhouse conditions. HARRY H. HILL. Va. Agr. Expt. Sta., *Tech. Bull.* 6, 121–53(1915).—*Conclusions:* Organic matter, as blue-grass, clover and alfalfa, when turned under in the soil, appears to pass over into nitrates. This is more marked in sterilized than in unsterilized soil. The total number of bacteria in soils treated with green manures was much greater than in those soils receiving no green manure treatment. Legumes gave in most cases the higher bacterial count. Pure cellulose in the form of Swedish filter paper caused a depression in the number of bacteria and in plant growth. The rate of nitrate formation was greatly improved by the presence of green manures. Paper in each soil type caused a depression in nitrate formation. In every case plant growth was benefited by the addition of green manures. Paper had a pronounced effect on plant growth and was the cause of the yellow appearance given to the plants. There was a smaller amt. of N in plants grown in pots treated with paper than in those grown on untreated soil. Soils vary in their power to accumulate N at different times. A bibliography of 27 titles is given.
R. C. ROARK.

A study of Colorado wheat. W. P. HEADDEN. Colorado Agr. Exp. Sta., *Bull.* 208, I, pp. 48(1915).—This investigation deals with the compn. of Colorado wheat, "more particularly with those factors which establish its quality on characteristics." Analyses of soils are given (soil and subsoil), using different acid solvents. The NO_3 content was usually detd. with a Zn-Cu couple. Nitrates were also detd. in the fallowed section. Total N detns. are included. Variations of total and nitric N are brought out as well as variations of P_2O_5 and K_2O. Among other points considered were nitrogenous compds. in the developing plants, ratios of leaves, stems and heads, the dry matter in the plants, the effects of fertilizers as indicated by the N content of the plant and the ash constituents of the plants.
B. E. B.

Report on insecticides. S. D. AVERITT. *J. Assoc. Off. Agr. Chem.* 1, 59–76 (1915).—Data are given and arguments brought forward showing the superiority of the I method over the $ZnCl_2$ method for the analysis of lime-S solns. Recommendations as to future work and as to changes in present methods are made.
W. H. FRY.

A comparison of the iodine titration and zinc chloride methods for the analysis of lime-sulfur solutions. R. C. ROARK. *J. Assoc. Off. Agr. Chem.* 1, 76–94(1915). —Lime-S is a complex soln. containing many compds. In the $ZnCl_2$ method all compds. that can interfere with titration of thiosulfate S are pptd. by addition of ammoniacal $ZnCl_2$ soln. or are rendered inocuous by neutralization of the filtrate with HCl. In the I titration method such compds. will markedly affect results obtained in the titrations. A theory is advanced explaining the discrepancies observed in the detd. and calcd. values for lime.
W. H. FRY.

A short method for the analysis of a lime-sulfur solution. S. D. AVERITT. *J. Assoc. Off. Agr. Chem.* 1, 95–6(1915).—Wash a 7-cm. ashless filter several times with suction, dry thoroughly in the water oven, put in a weighing bottle and weigh at once.

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Filter the sulfide S on this weighed filter, washing thoroughly, drying and weighing in the bottle as before. The difference in wt. is the sulfide S. During the first drying of the filter the titrations with I are made, 2 or 3 drops of dil. HCl added and the soln. placed on the water bath for a few min. (do not heat above 40° or 50°). When S collects, it is ready to be filtered. To the filtrate and one washing (the whole should not be over 40 or 50 cc.), add 2.5 cc. of 10% $BaCl_2$ soln., shaking thoroughly. Compare turbidity with a standard soln. of the same vol. W. H. FRY.

A report of chemical investigations on the lime-sulfur spray. H. V. TARTAR. Oregon Agr. Expt. Sta., *Res. Bull.* 3(1914); see *C. A.* 8, 1715, 2214, 2772. R. C. R.

The arsenates of lead. R. H. ROBINSON AND H. V. TARTAR. Oregon Agr. Expt. Sta., *Bull.* 128, 3–32(1915); see *C. A.* 8, 3648; 9, 1963. R. C. ROARK.

The direct assimilation of free atmospheric nitrogen in vegetation (MAMELI) **11D. Determination of potassium in fertilizers** (AJON) **7. Reaction between calcium hydroxide and sulfur** (AULD) **6.**

American Fertilizer Hand Book. 8th ed. Philadelphia: Ware Bros. Co. 400 pp. $1.00.

U. S., 1,155,560, Oct. 5. H. E. FRY. **Treating seed grain to facilitate its sprouting and growth.** The grain is immersed in a soln. of HNO_3 heated to about 27° while an elec. current is passed through the soln. and after removal the grain is sprayed with mineral oil to coat it preparatory to use in drilling machines. Other fertilizing substances may replace the HNO_3.

U. S., 1,155,797, Oct. 5. K. F. COOPER. **Calcium cyanamide for use as fertilizer** and containing varying proportions of CaO and CaC_2 is hydrated and rendered less dusty by stirring while H_2O and crude mineral oil are added to the material in sufficient amt. to effect hydration and decompn. of the carbide without raising the temp. enough to liberate NH_3. Only about 5% of oil is mixed with the H_2O and in this proportion it serves as a binder without interfering with the hydration.

U. S., 1,156,954, Oct. 19. R. E. WATSON. **A powdered insecticide,** for mixture with H_2O at the time of use, is made from Cu acetoarsenate 2.5, Pb arsenate 2.5 and $Ca(OH)_2$ 45 parts, to which may also be added S 30 and tobacco dust 20 parts.

Ger., 283,284, Sept. 28, 1913. Addition to 277,705. CHEM. FABRIK RHENANIA AND DR. A. MESSERSCHMITT. Mfg. **fertilizers** containing K and phosphoric acid in available form. Cf. *C. A.* 8, 3094.

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16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Wines with slightly alkaline ash. A study of the composition of the ash of pure and adulterated wines. W. J. BARAGIOLA AND C. GODET. *Z. Nahr.-Genussm.* 30, 67–100(1915).—The alkalinity of the ash of ordinary wines expressed as cc. *N* acid per g. of ash varies normally between 7 and 13. Twenty instances are given in which the alkalinity of pure wine of known history was found to fall below 7, the max. and minimum in these cases being 2.4 and 5.9, resp. These wines without exception had an unusually high P_2O_5 content (35 to 85 mg. per 100 cc.), the abnormal results being attributed to this cause. For this reason B. and G. point out the necessity of detg. the compn. of the ash when low alkalinities are found. Four cases are also given in which low alka-

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linity of the ash indicated adulteration, as shown by an analysis of the ash. Two of these wines were shown to contain added H_2SO_4, its presence being indicated by the high acidity of the wine, the amt. of SO_4 detd. directly in the wine, and by the SO_4 content of the ash. In such cases the amt. of SO_4 found in the ash is usually lower than that detd. directly in the wine owing to loss of SO_4 during ignition. In the case of high SO_4 caused by plastering this does not occur because only secondary sulfates are present. Another wine was shown to contain added NaCl, the sophistication being indicated by low alkalinity (2.9) and by the unusual amt. of Na and Cl in the ash. The Cl content (0.34 g. per l.) did not exceed the max. permitted by the Swiss standards, but when considered in connection with the alkalinity and the Na content of the ash it established the nature of the adulteration. In the same manner a Spanish wine was shown to contain added phosphates and NaCl. Analyses of wine ash are usually subject to many sources of error, chief of which is the tendency of $BaSO_4$ to carry down phosphates during the detn. of SO_4. To avoid this as much as possible it is recommended that the soln. be made strongly acid with HCl and then dild. to such an extent that the acidity may not interfere with complete pptn. of $BaSO_4$. The authors regard azolitmin paper as the best indicator for the detn. of alkalinity of wine ash, the presence of phosphates rendering phenolph. highly unsuitable, though it is prescribed by the Swiss official method. They also recommend the Farnsteiner method (*C. A.* 1, 1590) for detg. alkalinity, since it is founded upon rational scientific principles, and they show the desirability of applying it uniformly to all food products. An extensive bibliography is given. A. F. Seeker.

Use of a colorimeter with formol-titrations. Ludwig Adler. Munich. *Z. ges. Brau.* 38, 241–3, 251–2(1915).—Lüers' acidimeter (cf. *C. A.* 8, 3613) was slightly modified by Adler, the hollow prisms being replaced by hollow circular cylinders. The stable dye-soln. supplied with the app. matches exactly the color produced at the end point of a formol titration (characterized by $p_H = 9.1$). This soln. dild. with 10 vols. 96% alc. matches the color obtained in neutralizing a colorless soln. of amino acids previous to the addition of formol. A. proposes always to det. the preëxisting and the total formol-titratable N in malt (cf. *C. A.* 8, 2025) and points out that by the use of this colorimeter it is possible for each analyst to definitely fix stage 1, thus making the data obtained in different laboratories comparable. L. W. Haas.

The mycology and chemistry of the alcohol question. Olav Sopp. *Tidskrift Kemi. Farm. Terapi* 12(1915).—An assay continued throughout this vol. of the journal. The article is based on personal observations and the literature on the subject matter. The compn. of some brands of liquors obtained in the Norwegian market are given and discussed. A. R. Rose.

Manufacture of rum. E. Kayser. *Rev. gén. sci.* 26, 465–8(1915); cf. *C. A.* 9, 1658.—A review. L. W. Haas.

Ferments of rum. E. Kayser. *Compt. rend.* 161, 181–4(1915).—The compn. of rum essentially depends upon the fermentation organisms employed (*C. A.* 9, 1658). An especially important role is played by bottom yeasts (I), *Schizosaccharomyces* (II) and top yeasts (III). The volatile acids produced (which compete in the production of esters and flavor) vary in nature and quantity not only with the culture medium, but also especially with the type of yeast; they are affected by all factors influencing these organisms, *e. g.*, abundance or shortage of air, compn. and reaction of medium, temp., etc. Fernbach's statement, that the more acids are produced the less acid the original liquid is, was confirmed for rum yeasts with regard to volatile acids. The volatile acids produced in rums are formic, acetic and butyric acids. A mixt. of the volatile acids previously converted into their salts gave, when treated with H_2SO_4 and EtOH, a characteristic rum odor, variable with the type of yeast employed. Yeasts

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of type I furnished a more delicious odor, those of types II and III odors resembling arrack. If infusions of malt-dust with 10% sugar are fermented in portions with different acidities (neutral, 0.5 and 1.5% tartaric acid) the quantity of formic acid is augmented progressively with the acidity; yeasts II and III produce the max. quantity. The proportion of butyric acid was highest in neutral media. The yeast crop is decidedly lower in acid media. The proportions of butyric and acetic acids vary even with varieties of the same type of yeast, and with the nature of the medium. If to a sugar cane wort is added the same quantity of N in the form of peptone, $(NH_4)_2SO_4$ or asparagine, for yeasts of types I and II there results: with mineral N formation of almost pure acetic acid, with amino N an appreciable augmentation of formic acid, with peptone only slightly diminished proportions of butyric acid. Both types of yeast produce more butyric acid at 25° than at 35°. L. W. HAAS.

Studies on the hydrant water of Munich. ALBERT REICHARD. *Z. ges. Brau.* **38**, 169–74, 179–82, 187–90, 193–6, 201–3, 209–12, 217–20, 226–9, 233–6(1915).—The exhaustive exptl. work is a continuation of R.'s earlier investigations on Munich's water (*C. A.* **8**, 984) and may be summarized as follows: The pptn. of $CaCO_3$ starts at room temp. and increases with rizing temp. The formation of $CaCO_3$ at any temp. proceeds in the following stages: (1) Dissociation of $Ca(HCO_3)_2$ and expelling of HCO_3^-, (2) hydrolysis of $Ca(HCO_3)_2$ and formation of OH ions (primary alkalinity), (3) formation of CO_3^{--} and subsequently of $CaCO_3$, resulting in a decrease or complete disappearance of the primary alkalinity. The $CaCO_3$, is formed in a colloidal state and may be redissolved at higher temps. if for any reason its coagulation is prevented; this is associated with dissociation and hydrolysis. The formation and pptn. of $CaCO_3$ are favored by (1) artificial increase of OH^- ions (addition of lime water, alkalies), (2) sol. Ca salts (which cause the $CaCO_3$ to become coarser), (3) by the rapid formation of $CaCO_3$ particles, (4) by agitation. Retarding factors are (1) unlike ionic salts (Mg salts more than Na salts and sulfates more than chlorides and nitrates), (2) decrease of concn. of $Ca(HCO_3)_2$ (either by partial pptn. or interaction of $Ca(HCO_3)_2$ with other salts to form undissociated salts), (3) colloidal stabilizing substances, org. and inorg. Towards the end of the $CaCO_3$ pptn. the alk. reaction of $MgCO_3$ begins to be observed. As to alkalinity, the following was established: (1) An increase is caused by continued heating, especially after an intermediate filtration or decantation; (2) a permanent increase is effected by an addition of $MgSO_4$ (less so by $Mg(NO_3)_2$ or $MgCl_2$); (3) a temporary increase during heating is caused by Na salts; (4) a decrease or annihilation is effected by $CaSO_4$; (5) an increase is also caused by protective colloids for $CaCO_3$, unless $CaCl_2$ is counteracting or modifying; (6) formation of new OH^- ions occurs after each neutralization of the latter ("puffer" effect). With regard to decarbonating, the strongest checks were exerted by colloids, which may be org. or inorg. (water-sol. Ba salts in great diln.); in this case the heated water may remain almost clear but possesses a strongly alk. reaction. $MgCO_3$ in greater concn. attains, on heating, colloidal properties and may then influence the solubility of $CaCO_3$, as is shown by the very slow pptn. of $CaCO_3$ on addition of Mg salts. Other factors exerting a retarding influence on decarbonating are Na salts in a less degree, Mg salts in a higher degree, interruption of heating, diln. of $Ca(HCO_3)_2$ and resting of liquid. Factors favoring decarbonating are Ca salts, cane sugar, water-sol. Ba salts in higher concn. and agitation. L. W. HAAS.

Polarimetric starch determination in brewers' grains (and barley). F. M. WIENINGER. *Z. ges. Brau.* **38**, 257–60, 265–7, 273–4, 281–3, 289–91(1915).—The action of phosphotungstic acid and $ZnSO_4$ on dissolved starch was studied and the following procedures for the detn. of starch adopted: *For grains.* These are to be thoroughly washed and dried. Introduce 2.5 g. of the finely ground grains into a 100 cc. measuring

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flask with wide neck and add 2.5 cc. 1% $ZnSO_4$ soln. After the grains are thoroughly soaked, add 25 cc. H_2SO_4 (d. 1.4) from a buret under continued shaking, and place the flask in a water bath at 22°, occasionally mixing the content of the flask. After 20 min. add 25 cc. H_2SO_4 (d. 1.4) and 10 cc. 25% $ZnSO_4$ (the latter to ppt. a levo-rotatory substance), mix and fill the flask to the mark with H_2SO_4 (d. 1.3). Mix well the contents of the flask and filter through a folded filter resting on a small plain filter. Filtration is interrupted after 30 min. Allow the turbid filtrate (not to be poured back) to stand for 4–5 hrs. and then pour into a 300 cc. Erlenmeyer contg. 6–7 g. purest $BaSO_4$. After mixing well filter through a double filter. Pour the filtrate back until it runs perfectly clear. If worked properly, the filtrate is pale yellow, brilliant, easy to polarize, remains clear for 12 hrs. and does not change its power of rotation. The rotation of this liquid gives the total rotation. To det. the permanent rotation (due to non-starchy substances) introduce 2.5 g. of grains into a 100 cc. flask together with 25 cc. H_2SO_4 (d. 1.4). Keep the flask at 22° for 20 min., occasionally shaking. Then add 25 cc. H_2SO_4 (d. 1.4) and 20 cc. 8% phosphotungstic acid, fill up to the mark with H_2SO_4 (d.1.3), mix and filter perfectly clear. Filtration proceeds quickly and the filtrate is nearly colorless and ready to be polarized. % starch = (total — permanent rotation) × 10.16. The factor 10.16 refers to a 2.5 g. sample and a 20 mm. tube. (10.16 = (40 × 100)/-(2 × 196.8)). *For barley.* To det. the total rotation, moisten 2.5 g. barley meal in a 100 cc. flask with 5 cc. 1% $ZnSO_4$ soln., then add 50 cc. H_2SO_4 (d. 1.4) and allow to stand at 22° for 1 hr., shaking every 10 min. After adding 20 cc. 25% $ZnSO_4$, fill up to mark with H_2SO_4 (d. 1.3), etc. Filtration proceeds rapidly and after mixing with 6–7 g. $BaSO_4$, the liquid may at once be filtered clear and polarized. The filtrate is pale yellow and does not change its rotatory power within 4 hrs. For the detn. of the permanent rotation, only 1 g. of substance is employed and 25 cc. 8% phosphotungstic acid are to be used; the time of digestion is 1 hr. By multiplication with 2.5 the observed permanent rotation is calcd. to a 2.5 g. sample, and the starch content is then calcd. as with grains. The method is claimed to be very accurate and to give results in close agreement with the method of Lintner and Schwarcz (*C. A.* 7, 3637) with regard to the magnitude of polarization; a small difference in the final result is due to the use of the factor 10.1 by the latter. L. W. Haas.

The nitrogenous substances of yeast. Jakob Meisenheimer. *Wochschr. Brau.* 32, 325–6(1915).—To cleave the protein substances yeast was subjected to autolysis in presence of toluene. The amino acids formed were sepd. by Fischer's ester-method. Nearly all monoamino acids known to be cleavage products were found to occur in yeast protein: glycocoll, alanine, valine, leucine, proline, phenylalanine, aspartic and glutamic acids, tyrosine, tryptophan, and probably serine and cystine. Glucosamine, so often looked for in vain, was isolated from the products of hydrolysis by HCl of the cell residues not attacked by autodigestion. There is also probably an aminobutyric acid present. Nitrogen in yeast protein is distributed as follows: ammonia N = 11% alloxur-bases (nuclein bases) N = 7%, arginine-hystidine N = 22%, lysine-choline N = 4%, monoamino-acid N = 56%. L. W. Haas.

Experiments on the enrichment of crude alcohol with higher alcohols by the vitality of yeast. G. Heinzelmann and Joh. Dehnicke. *Z. Spiritusind.* 38, 316, 328, 347(1915).—The types of yeast examd. show an equal capacity for producing higher alcs. The production of higher alcs. is least in potato mashes, higher in molasses mashes and highest in grain and corn mashes. Wild yeasts (fruit yeasts) differ much with regard to the formation of higher alcs. With little pitching yeast more higher alcs. are obtained than with much yeast. A higher sugar content of the mashes decreases the amt. of higher alcs. The yield of these alcs. is higher at the normal fermentation temp. than at any other temp. Aeration has no influence. Only in sugar solns.,

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to which leucine had been added, aeration increases the yield of higher alcs. The nitrogenous yeast food in the mashes is of the utmost influence on the production of higher alcs. Asparagine, NH_4 salts, autolyzed yeast and ext. of malt-culms added to the mash effect a diminution of the higher alcs.; their production may even be almost completely inhibited by a sufficient quantity of asparagine or $(NH_4)_2SO_4$. An increase may be attained by adding leucine to the mashes, provided they contain but little nitrogenous yeast food more readily assimilable than leucine. Yeast stimulants in general effect a decrease in the production of higher alcs. L. W. Haas.

Yeast protein. Carl Neuberg. Kaiser Wilhelm Institut, Berlin. *Wochschr. Brau.* 32, 317–20(1915).—The maceration juice obtained according to Lebedev from dried yeast was heated on a water bath to coagulate the dissolved protein, the pptd. protein filtered off, washed with water, dehydrated by abs. alc., and then disintegrated in a mortar in the presence of alc. and ether. Yeast protein was finally obtained as a white powder, which gave all the common protein reactions. The N, S and P content of the proteins of different yeasts is very similar; for one was found: N 13.15, S 0.93, P 0.61%. A greater portion of the isolated protein was hydrolyzed by fuming HCl according to Fischer, the amino acids esterified and the esters fractionated. It was established beyond doubt that alanine is among the radicals building up the yeast protein molecule. Tryptophan is also present to the extent of about 0.2%. L. W. H.

Kilning of grain. Karl Windisch. Hohenheim. *Wochschr. Brau.* 32, 309–12 (1915).—Grain is suitable for long storage if its moisture content is between 12 and 13%. Excessive moisture is best reduced by drying the grain on kilns as used in the malthouses. The layer of grain on the kiln may be made 15 to 20 cm. thick according to the draft available. The kilning temp. should not exceed 48°; with grains for milling purposes 55° is permissible. L. W. Haas.

Aluminium paint as coating for wooden fermenters. Rob. Heuss. *Z. ges. Brau.* 38, 177–9, 185–7(1915).—Al paint is without influence on the course of fermentation, is not attacked by the fermenting wort and does not impart any taste to wort and to a 4% alc. The coating is attacked by nearly all common disinfectants in the usual concn., CH_2O being an exception, and is little resistant to mechanical cleaning procedures. L. W. Haas.

Characteristics of the barleys of 1915. Franz Koritschoner. Vienna. *Brau.-Malzind.* 16, 198–201(1915); cf. *C. A.* 9, 350.—Tabulation of analyses of 60 barleys of different provenience with regard to moisture, hl.-wt., assortment as to size, 1000 berry-wt., protein, N per berry, yield of ext., and germinating energy and capacity. L. W. Haas.

Experiences with "Regenerite." Robert Heuss. *Z. ges. Brau.* 38, 249–51 (1915).—H. records favorable results with "Regenerite," if added to pitch in not too large quantities (not exceeding 10%). L. W. Haas.

Ionization of the gases produced during fermentation (Potter) 2. Utilization of total brewery waste for feeding purposes (Ulrich) 12.

U. S., 1,154,989, Sept. 28. B. Hehle. **Preparing grain for brewing.** The husks of the grain are opened longitudinally to expose the mealy contents by forming a filter-bed of the grain and passing sparging liquid, *e. g.*, H_2O, through it at a temp. of 69–72°.

U. S., 1,156,448, Oct. 12. R. Wahl. **Salts for "burtonizing" brewing waters** containing principally $CaSO_4$ and NaCl, are prepared by melting cryst. Na_2SO_4, mixing with $CaCl_2$ and sepg. the excess of H_2O from the pasty mass formed.

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Brit., 11,330, May 7, 1914. I. POLLAK. **Diastatic malt extracts.** See Ger., 283,616 (*C. A.* 9, 2570).

Brit., 11,329, May 7, 1914. I. POLLAK. **Mfg. diastatic extracts.** See Ger., 283,061 (*C. A.* 9, 2568).

Brit., 14,371, June 15, 1914. BAYER & Co. **Fermenting sugar** and materials containing sugar, such as molasses, to form **acetone and ethyl alcohol,** by means of *Bacillus macerans* in the presence of indifferent materials, such as asbestos, filter paper, peat, peels of potatoes, fruit, etc., and preferably also of nutritive materials, such as pressed yeast, yeast ext., acrospires, etc. Chalk may be added to neutralize acid formed during the fermentation.

Brit., 14,459, June 16, 1914. A. CHAUSSEPIED. An app. for **preparing sparkling wine** and other fermented beverages, applicable also for aerating liquids, consists of a vat enclosed in an air-tight casing which is fitted with a coil for circulation of a heating or cooling agent from a vat and with a detachable air chamber carrying a pump by which air or gases of fermentation may be withdrawn through a pipe and injected by a pipe into the liquid in the vat. O or clarifying liquids, etc., may be introduced. A racking-pipe passes through a bush in the base of the vessel and is carried by a screwed casing so as to be adjusted to project above the sediment. Samples may be withdrawn hrough a nozzle under counter-pressure supplied by a pipe. The fermented liquid s racked after cooling in app. under counter-pressure of CO_2, O, sterilized air, etc.

Ger., 280,269, Oct. 6, 1912. Addition to 277,936 (*C. A.* 9, 1223). U. WEGENER. **Mfg. crystal liquors and brandies.**

17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

Diogenal, a new sedative and hypnotic. F. STREBLOW. *Deut. med. Wochschr.* 41, 278(1915).—Diogenal (Merck) has the formula $C_{11}H_{16}O_2N_2Br_2$. It is a dibromopropyldiethylbarbituric acid. It is locally indifferent and 4 times less toxic than veronal (diethylbarbituric acid). As sedative it is recommended in doses of 0.5–1.0 g. 3 times a day, as hypnotic in doses of 1 g. S. AMBERG.

Treatment of chronic heart and kidney diseases with "Theacylon." A. HOFFMANN. *Münch. med. Wochschr.* 62, 1108–10(1915).—"Theacylon" is acetylsalicyltheobromine and a very good diuretic in doses of 1 to 4 g. per day. S. AMBERG.

Iodometric estimation of quinine. ERW. RICHTER. *Apoth. Ztg.* 30, 254–5(1915).—The article deals with a modified form of R.'s method for estg. quinine by means of picric acid (cf. *C. A.* 7, 677), involving the use of a soln. of KI + KIO_3 in connection with the titration of the alc. acid filtrate from the quinine-picric acid compd. This procedure is stated to be superior to the one involving the use of hematoxylin as indicator. W. O. E.

Applied plant microchemistry. XI. Detection of baptisin in Baptisia tinctoria (root). O. TUNMANN. *Apoth. Ztg.* 30, 272–4(1915); cf. *C. A.* 9, 1660. W. O. E.

Apparatus for sterilizing and filling ampoules in the drug store. C. STICK. *Apoth. Ztg.* 30, 286–7(1915).—A description of several practical appliances for accomplishing the object in question together with information relative to sources of supply. W. O. E.

Determination of nicotine in tobacco and tobacco preparations. H. B. RASMUSSEN. *Chem. Ztg.* 39, 25(1915).—Silicotungstic acid is used as the alkaloid precipitant, yielding the compd. $2C_{10}H_{14}N_2.2H_2O.12W_2SiO_2 + 5H_2O$, which on drying

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at 120° loses its H_2O of crystn. Tobacco or its prepns. are first treated with a 20% NaOH soln., then exhausted with a mixt. of Et_2O and petr. ether, whereby all the nicotine is taken up by the solvent mixt., from which the alkaloid is later sepd. by shaking with dil. HCl and pptd. with silicotungstic acid. W. O. E.

Oil of Pistacia lentiscus. E. SERNAGIOTTO AND NERINA VITA. Bologna. *Ann. chim. applicata* 4, 92–3(1915).—Sepd. from the volatile portion by distg. in a current of steam, the oil has the following consts.: d_{15} 0.9188, n_D^{14} 66.00 (Zeiss butyro refractometer), acid no. 15.92, sapon. no. 165.58, sapon. no. after acetylization 203.03, Hehner no. 94.824, Maumené no. 46.2, I no. 83.61, I no. of acids 85.96. Palmitic and oleic acids were sepd. and identified. The volatile portion, amounting to about 0.5%, had a terpene odor, d_{15} 0.8654, $[\alpha]_D$ + 0, b. 165°, Br number 285.4. S. LEVY.

Tasteless quinine derivatives which are employed in therapeutics. VIRGINIO LUCCHINI. Milan. *Boll. chim. farm.* 53, 344–58(1914).—L. has reviewed the most important portion of the literature which relates to tasteless derivs. of quinine, especial reference being made to aristoquinine, insipin, quinaphenin, rheumatin, euquinine and saloquinine. H. S. PAINE.

Extraction of stachydrine. N. T. DELEANO. Bucharest. *Bull. soc. stiin. Bucharest* 23, 39–42; *Chem. Zentr.* 1914, II, 647–8.—Extn. of the base with an alc. $HgCl_2$ soln. may be substituted for the phosphotungstic acid method for the purpose of obtaining choline, betaine and especially stachydrine, $[\alpha]_D^{18}$ —26.2°, decreasing to —9.2° or —9.3° after a period of contact with bases or acids; the base is completely racemized by boiling with concd. alkali. H. S. PAINE.

Adulteration and its detection in ethereal oils. O. WARD. *Seifensieder-Ztg.* 42, 743–4, 765–6(1915).—Description of known methods for the examn. of anise, bergamont, clove, neroli, orange, peppermint, rose, cassia and citron oils. E. SCHERUBEL.

Preparation of aristol. ANON. *Pharmazevtizeski Journal* 1915, 153; *J. pharm. chim.* 12, 164(1915).—Take thymol 15.0, NaOH 20.0, I 6.35, KI 8.3. Dissolve the thymol in 250 cc. of H_2O, add NaOH. Also make soln. of I and KI in 250 cc. of H_2O; mix the 2 solns. A ppt. forms which at once redissolves. Into the opalescent green liquid pour, in small amts. as long as a ppt. forms, a concd. NaCl soln. Filter, collect the ppt., dry in the dark below 50°. Thymol must not contain thymene which would cause formation of CHI_3. S. WALDBOTT.

Note on sirup of tolu, British Pharmacopeia 1914. F. GOLDBY. *Pharm. J.* 95, 300–1(1915).—Instead of 400 cc., as directed by the Brit. Pharm., 350 cc. of aq. tolu ext. should be mixed with 660 g. of sugar so as not to exceed the total limit of 1000 g. set by the pharmacopeia. S. WALDBOTT.

Merzalin. MERZ & Co. Frankfurt a/M. *Schweiz. Apoth. Ztg.* 53, 465–6(1915); cf. *C. A.* 9, 2691, and *Pharm. Ztg.* No. 50(1915).—A defence of the use of talcum as ointment base. Expert testimony is quoted. S. WALDBOTT.

"Digosid," a new preparation from digitalis. F. WRATSCHKO. *Z. allg. Oest. Apoth. Ver.* 1915, 215; *Pharm. J.* 95, 199(1915).—Excluding enzymic action and working in neutral soln. at low temp., W. has prepd. "digosid," a white amorphous powder, sol. in $CHCl_3$, MeOH, EtOH, amyl alc. and C_5H_5. It dissolves with difficulty in Et_2O, CCl_4, H_2O (1:850) and benzine, and is almost insol. in petr. ether. Like gitalin, it is decompd. by boiling with EtOH, but unlike gitalin, it resists boiling with H_2O. It gives the test for gitalin and digitoxin. The 1:2000 soln. in physiol. NaCl soln. has the taste of a digitalis infusion. S. WALDBOTT.

The cause of discoloration of suprarenine hydrochloride. J. L. ELPHINSTONE. Aberdeen. *Dental Cosmos* 57, 656–58(1915).—The discoloration of suprarenine-HCl is due to atmospheric ammonia. JOSEPH S. HEPBURN.

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A contribution to the history of emetine. HERMANN PRINZ. Univ. Penna. *Dental Cosmos* 57, 313–15(1915).—A history of ipecac and of emetine. J. S. H.

Vegetaline as basis for surgical liquid soaps. *J. pharm. chim.* 12, 81–5, 113–23 (1915); *Pharm. J.* 95, 360(1915).—Since the warm solns. of Na soaps form gels upon cooling, even in diln. of 1:400, only K soaps can be used, best made from vegetaline, a com. form of coconut oil. This soap is of definite compn., very sol., colorless and very foamy. Its prepn. is quantitative and requires the following steps: (1) Detn. of sapon. no. of vegetaline: 248.4. (2) Prepn. of KOH of definite strength, *e. g.*, 336 g. per l. (d. 1.270). Then 100 g. vegetaline require 24.84 g. KOH or 73.9 cc. (d. 1.270). As glycerol is not removed, 1 kg. vegetaline will yield 1.250 kg. dry soap, or 2.5 kg. of soft soap with 50% H_2O. (3) Prepn. of a small amt. of a 50% K soap, *e. g.*, 250 g. by alcoholic sapon., to aid in (4) prepn. of K soap by non-alcoholic sapon. Heat 50 g. of soap from (3) with 50 g. H_2O on water bath in a 2 l. Ni capsule for 10 min. Then add 369.5 cc. KOH, (d. 1.270), warm to 85–90°, add 500 g. vegetaline, stir continuously with Fe spatula. The mass gradually thickens, and after 8–10 min. becomes stiff. Cut the mass, add 300 cc. H_2O, cover with plate and heat 1 hr. longer, then cool. Bring with H_2O to 1250 g., crush the lumps, set aside 48 hrs. A homogeneous mass results, completely sol. in H_2O to a very conc. soln. (*e. g.*, as much as 750 g. of 50% soap in 1 l.), nearly as mobile as H_2O. For liquid soaps, 250 g. per l. may be used. The foaming qualities are tested by the persistence of the foam, *i. e.*, by the decrease of its thickness in mm. with time. With due precautions reliable data are obtained.

S. WALDBOTT.

A history of antiseptics. "CHEMICUS." *Pharm. J.* 95, 324–5(1915).—The early history since 1751 is briefly recorded. Lister's work and his coöperation with Martindale (1886) in evolving $Hg(CN)_2.Zn(CN)_2$ as an antiseptic is mentioned, also its prepn. by Dunstan (1892). Attention is called to the discovery, prompted by war needs, of an efficient and safe antiseptic by Lorrain Smith and coworkers (*Brit. Med. J.* July 24, 1915). Two preps. are described: (1) *Eupad*, a solid prepared by rubbing together equal amts. of dry $CaOCl_2$ and powdered H_3BO_3; (2) *Eusol*, a liquid, prepared by adding 1 l. of H_2O to 25 g. of the solid, filtering after several hrs. The soln. contains HClO 0.54%, Ca biborate 1.28, $CaCl_2$ 0.17%. This prep. closely resembles that of Carrel and Dakin (*Times*, Aug. 6, 1915).

S. WALDBOTT.

Strength of picric acid as an antiseptic. H. L. TIDY. *Lancet* 1915, 604; *Pharm. J.* 95, 397(1915).—Picric acid has been used with success for the sterilization of the skin before operations in 2–3% solns. in EtOH. Expts. have shown that the Rideal-Walker carbolic acid coeff. of picric acid is exactly 6; a 0.165% soln. of picric acid has the same bactericidal powers towards 24-hr. broth cultures of typhoid bacteria as has the standard 1% soln. of carbolic acid.

S. WALDBOTT.

Notes on colchicum seeds. J. C. UMNEY. *Pharm. J.* 95, 393(1915).—Variations of 1.7–4.1 g. extractive matter per 100 cc. of tincture of colchicum, due to reducing sugar surrounding the seeds, suggest possible adulteration with glucose. Seeds removed from ripened colchicum by E. M. Holmes yielded to 70% EtOH 5.38% reducing sugar. Again, U. in 1905 found that seeds from undehisced capsules in wet season gave as high as 6.7% saccharine matter, in dry season only 1.75–3.35%. Thus the amt. of sugar naturally present in seeds directly after removal from the pods was rather more than that present in com. seeds.

S. WALDBOTT.

Persian galbanum. PROSPER H. MARSDEN. *Pharm. J.* 95, 356–8(1915).—M received com. specimens, oddly packed in the hollow of umbelliferous stems, 21 cm. X 4 to 4.5 cm. Tears 0.5–1 cm. diam. were imbedded in a sticky mass. The odor was that of [illegible] taste bitter; [illegible]one test (*Brit. Pharm.* 1898). H_2O

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7.36%, ash of resin 2.29%. HCl gave violet-red color after warming; $CHCl_3$ + KOH on heating gave brown color. 78.55% of the gum resin was sol. in cold EtOH. 5.93 g. gum resin extd. successively, yielded to petrol. spirit 0.25, Et_2O 2.875, MeOH 0.060, H_2O at 49° 0.340 g. Two mericarps were picked out from the specimen and compared microscopically with one from another specimen of com. galbanum, and with two herbarium specimens of *Ferula galbaniflua*. Boiss. and Buhse. Illustrations are given. It appears that the fruits found in liquid or solid galbanum now on the market are not those of *F. galbaniflua* (cf. J. Small, *C. A.* **7**, 2658). E. M. Holmes adds that it is probable but not absolutely certain that the fruits found in the gum resins are those of the plant yielding it. S. WALDBOTT.

Modifications of the formulas for ammoniacal silver nitrate, and iodized potassium iodide. F. RICHARD. *J. pharm. chim.* **12**, 161–4(1915).—In ammoniacal $AgNO_3$, Fr. Cod. 1908, the amt. of NH_4OH is exactly sufficient to dissolve the Ag_2O first pptd. When NH_3 is lost by evapn., the pptd. Ag_2O is liable to be mistaken for reduced Ag, *e. g.*, in testing for aldehydes. R. proposes to add to a 5% $AgNO_3$ soln. an equal vol. of NH_4OH (d. 0.925). Air-dried $AgNO_3$ may be used. In iodized KI of the Codex, the amt. of KI (2 g.) is insufficient to dissolve the I required (4 g.). By dilg. to 100 g., some of the dissolved I will be repptd. R. proposes the formula: I cryst. 40 g., KI 80 g., H_2O to make 1000 cc., not grams. Put the I and KI into a 1000 cc. flask, add 20 cc. H_2O, agitate for 2 hrs., complete to 1000 cc., mix. This manipulation allows the prepn. of massive doses of I in a small vol. for ointments, *e. g.*, I 500 g., KI 1000 g. (reducible even to 760 g.), H_2O first 250 g.; after 2 hrs. stirring, more H_2O to make 1000 cc. S. WALDBOTT.

Color reaction for atropine, hyocyamine and scopolamine (WASICKY) **7**. The composition of the tobacco plant at different stages of growth (PANNAIN) **11D**.

ATKINSON, G. W.: **Perfumes and Cosmetics: Their Preparation and Manufacture.** Trans. 4th ed. New York: Henley. 344 pp. $5.00.

U. S., 1,156,044, Oct. 12. L. ACH and A. ROTHMANN. **3,4,5,3′,4′,5′-Hexaaminoarsenobenzene** is made by treating 3,5-dinitro-4-aminobenzene-1-arsinic acid with Sn and HCl, or Na hydrosulfite. It is sol. in dil. acids, insol. in alk. solns. and usual organic solvents, decomposes rapidly when exposed to air and has a strong germicidal effect, especially on *Spirilla*.

U. S., 1,156,045, Oct. 12. L. ACH, A. ROTHMANN and H. DIETERICH. **4-Methylamino-2-chlorobenzene-1-arsonic acid,** a white powder, m. 211°, insol. in cold H_2O, acetone and $CHCl_3$, sol. in hot H_2O and alc. and having strong bactericidal action, is made by reacting on *m*-chloromethylaniline with $AsCl_3$ while heated on a water bath, treating with NaOH, extg. unchanged material with ether, acidulating to obtain 4-methylamino-2-chlorobenzene-1-arsenic oxide (m. 120°) and treating the oxide with NaOH, H_2O_2 and acid successively. 4-Dimethylamino-2-chlorobenzene-1-arsonic acid, a white powder insol. in cold H_2O and alc. but sol. in hot alc., may be similarly made from *m*-chlorodimethylaniline.

U. S., 1,156,134, Oct. 12. H. DECKER. **Alkyl derivatives of nor-hydrohydrastinine** are made by condensing homopiperonylamine with an aldehyde, *e. g.*, CH_2O, condensing the product by the action of 20% HCl to close the open chain into a ring, and then alkylizing at the N atom by treatment with Me_2SO_4. The iodide, $C_{11}H_{[illegible]}$, yellow needles, m. 241°. The cryst. hydrochloride m. 274–6° and [illegible] needles) m. 174–6°. The products are all stated to be [illegible]

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U. S., 1,156,609, Oct. 12. R. G. MEWBORNE. **Extracting nicotine from tobacco dust or other finely divided tobacco.** The tobacco is continuously passed through a steam-heated drum while agitated by paddles to keep it suspended in the form of a cloud and steam from a superheater is passed through the drum to ext. nicotine from the tobacco; it then passes to a dust separator and condenser for recovery of the volatilized nicotine.

U. S., 1,157,348, Oct. 19. E. VON PORTHEIM. **Oxalic acid is made by introducing** NO_2 into a soln. of HNO_3 and sugar in the presence of oxides of Mo or V which act as catalyzers.

U. S., 1,157,402, Oct. 19. M. LANDAU. **Pure lactic acid is produced by decolorizing ordinary commercial acid by boiling with animal charcoal while passing an inert gas through the mixt., concg. the decolorized product *in vacuo*, adding alc. to ppt. saccharin or other organic impurities, and distg. off the alc. after sepg. the ppt.**

Brit., 13,866, June 8, 1914. BAYER & Co. **Urea derivatives.** See Ger., 278,122 (*C. A.* **9**, 1096).

Brit., 14,017, June 10, 1914. BAYER & Co. **Antiseptic compounds containing** Bi and I are obtained by treating gallocarboxylic acid with BiOI, or by treating with HI the basic Bi salt of gallocarboxylic acid described in 16,715, 1913 (*C. A.* **9**, 355).

Brit., 14,113, June 11, 1914. CHEM. FABRIK GRIESHEIM-ELEKTRON. **Acetic acid** is prepd. by passing C_2H_2 and O alternately or simultaneously into acetic, chloroacetic, lactic, or other organic acid which contains H_2O and to which has been added a Hg compd., with or without H_2SO_4, bisulfate, etc. Aldehyde is first formed when passing in C_2H_2, and then oxidized to HOAc by the O subsequently introduced.

Brit., 14,862, June 20, 1914. L. SARASON. In prepg. **carbon dioxide solutions** for use in baths, etc., the soly. of the gas is increased by adding to the H_2O coloring matters from animals or plants, such as chlorophyll, hemoglobin, metal, acid or alk. derivs. of those compds., gall, exts. of leaves or of wood.

Ger., 284,231, June 9, 1912. CHEM. FABRIK VON HEYDEN AKT.-GES. **Mfg. nitrogen substitution products of the amino derivatives of primary and secondary aromatic antimonic acids** and their derivs. by introducing acyl, alkyl, aryl, or aldehyde residues into the amino groups; they serve for the production of valuable therapeutic substances.

Ger., 284,233, Oct. 19, 1913. KALLE & Co. **Mfg. derivatives of 2-phenylquinoline-4-carboxylic acid** by condensing *o*-, *m*-, or *p*-hydroxyacetophenone with isatin, or *m*- or *p*-hydroxybenzaldehyde with aniline and pyroracemic acid. The products are applied therapeutically.

Ger., 284,234, Dec. 17, 1913. K. H. SCHMITZ. **Mfg. gold-N-alkylhexamethylenetetraminehalocyanides** for application in the treatment of infectious diseases, by allowing free halogen to act on the double compds. of hexamethylenetetraminealkylcyanides and Au cyanides of the general formulas $C_6H_{12}N_4$.alkyl.CN.Au^{I}-CN and $C_6H_{12}.N_4$.alkyl.CN.$Au^{III}(CN)_2$, or by bringing into double decompn. the K-Au-Hl-cyanides of the comp. $KAu(CN)_2Hl_2$ and the salts of the hexamethylenetetraminealkylhydroxides.

Ger., 284,259, Dec. 5, 1913 and addition 284,260, Mar. 12, 1914. K. H. SCHMITZ. **Mfg. double compounds of the salts of hexamethylenetetraminealkylhydroxides and salts of heavy metals.** If the halogen, thiocyanogen, or cyanogen salts of heavy metals (Cu, Hg and Au), or the alkali double compds. of these metals with the specified acids are allowed to act upon salts of hexamethylenetetraminealkylhydroxides, valuable double compds. are obtained. Of these the Hg double salt is said to find ap-

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plication as an antiluetic agent, while the complex Au and Cu compds. appear to be suitable for the treatment of tuberculosis. In an addition patent the method of prepg. the double salt is modified by acting on the aq. solns. of hexamethylenetetramine-alkylhalides with $AuCl_3$ soln., or on the aq. solns. of alkali salts of hydrogen halogen auric acids with hexamethylenetetramineakylhalides. The AuI_3 double compds. are especially suitable.

Ger., 284,319, Mar. 1, 1914. Kalle & Co., Akt.-Ges. **Mfg. stable preparations from organosols and fatty compounds.** The various colloids differ with respect to their permanency, *i. e.*, as to the ease with which their organosol or hydrosol character may be preserved. Also, when the stability is increased by a protecting colloid, such as wool fat in the case of organosols or Na protalbinate in the case of hydrosols, still not all organic colloids are equally stable in combination with such protecting colloids. By this process the stability of these organosols can be materially increased, and made almost perfectly permanent, if such a consistence be given to the fats serving as solvents that they are solid or practically solid at the ordinary temp. If a wool-fat organosol be dissolved in a fat or fat mixt. which liquefies at a gentle heat, the solvent, solidifying at the room temp. prevents the aggregation of the colloidal particles which are therefore fixed in the solid solvent, so that the organosol is rendered stable. By the combination of a solid fat with low I number, or of a fat reduced by catalytic hydrogenization to a zero I number, or even of solid glycerol esters produced synthetically, with an indifferent solvent, liquid at the ordinary temp., the prevention of catalytic oxidizing action of inorganic organosols (such as metal catalyzers) on the soln., and the permanent preservation of their organosol character are possible. The solid fats of low I number specified are, especially, the purified palm nut oil and pure coco fat (*e. g.*, palmin), and the indifferent solvents mentioned are capryl and caprin esters or ethers, as well as liquid or low-m. glycerides of purified fatty acids (*e. g.*, tributyrin). *E. g.*, 1 part of the organosol of $Pd(OH)_2$ (cf. 268,311, *C. A.* 8, 1488) with 20% Pd content, is dissolved with gentle warming in a mixt. of palmin (I number about 8) and caprin ether. The mass is then incorporated with the same mixt. to obtain the desired metal content, *e. g.*, 10 parts for a soln. with 2% Pd content. This soln. is perfectly stable, and the contained fat does not become rancid.

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

The production of sulfuric acid and a proposed new method of manufacture. William W. Waggaman. U. S. Dept. Agr., *Bull.* 283, 39 pp.(1915).—Statistics and brief descriptions of existing methods of manuf. are given. A lead spiral is proposed as a substitute for chambers. Expts. show that by passing SO_2, air, and water vapor through a lead spiral in the presence of an adequate supply of N oxides, the formation of H_2SO_4 is practically complete, even when the gases are run at quite a rapid rate. The yield of acid was not so great with a glass as with a lead spiral, and comparative results indicate that the lead spiral has some influence on the oxidation of SO_2 to H_2SO_4. While $PbSO_4$ has some influence on the oxidation of SO_2, lead or lead oxide is a much more energetic catalytic agent. Classified tables of all American patents on the manuf. of H_2SO_4 give patent number, year, patentee, reagents used, app. employed, treatment, and object of app. or process. W. H. Fry.

Internal temperature of sulfur furnaces. Stefano Pagliani. Palermo. *Ann. chim. applicata* 4, 75–81(1915).—The literature contains little on this subject. The temp. in furnaces used for extg. S, as the Gill furnace, is supposed to be about 300°.

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In furnaces used for producing SO_2, little is known as to the internal temp. By algebraic calcn., the theoretical temp. of combustion of S at const. vol. in just sufficient air is found to be 1990° and 2010°, using Langen's, and Langen and Pier's formulas, resp. At const. pressure under the same conditions, the temp. is calcd. to be 1100° and 1297°, using Mallard and Le Chatelier's, and Le Chatelier's formulas, resp. By graphic methods, the temp. of combustion at const. vol. is found to be 1620°, 2500°, and 1900°, using Mallard and Le Chatelier's, Pier's, and Le Chatelier's formulas, resp., and at const. pressure, 1605°, 1640°, 1650°, using Langen's, Holborn and Henning's, and Pier's formulas, resp. P. takes as an av. the value 1616° at const. press., and 2000° at const. vol. Considering, however, that in actual practice an excess of air is employed, P. deduces 900° as the theoretical temp. of combustion at const. pressure. He measured the temp. in a SO_2 furnace of 3 pans, of simple construction, in a H_2SO_4 plant, using a Le Chatelier thermo-elec. pyrometer, with Pt-Rh soldering, protected by a porcelain tube. The highest temp. found was 550°; the lowest could not have been less than 500°. In combustion furnaces for extg. S from the mineral, the temp. cannot be below 250°. P. concludes that the proper temp. should be 330–340°.
S. LEVY.

Fifty-first annual report on alkali, etc., works, by the chief inspector. Proceedings during the year 1914, pp. 126; *J. Soc. Chem. Ind.* **34**, 794–6.—Statistics of the alk., NH_3, Cu, H_2SO_4, HNO_3, HCl, Sn, Zn, cement, and fertilizer works registered in England, Wales, Ireland and Scotland are given, including comparisons with the 1913 output. Extensive notes on methods and improvements are interspersed, and the establishment of a properly staffed and equipped center for research and advice is suggested.
L. W. RIGGS.

The possibility of extracting potash salts through systematic leaching. J. FÜRER. *Kali* **9**, 168–70, 185–6, 200–3, 222–5, 237–9(1915).—Without offering new exptl. results, methods are proposed for manufacturing K salts by dissolving carnallite or other K material in place, and subjecting the resulting brine to fractional evapn. in vacuum pans.
W. B. HICKS.

Graphite contaminated in transit. O. BINDER. *Chem. Ztg.* **39**, 737(1915).—A cargo of Ceylon graphite contaminated with leaves, stems and grain was almost completely purified by stirring and pouring off. Or, it may be heated in retorts and the organic matter charred and similarly removed, or, for most purposes, left in.
J. H. MOORE.

Chemical patents. II. The application for and prosecution of applications for United States letters patent. S. C. MASTICK. *J. Ind. Eng. Chem.* **7**, 874–87(1915).—A lecture (cf. *C. A.* **9**, 2794).
E. J. C.

Opportunities for the American chemical industry. EDWARD E. PRATT. *Met. Chem. Eng.* **13**, 729–31(1915).—An address.
E. J. C.

Foreign markets for American chemicals. T. H. NORTON. *Met. Chem. Eng.* **13**, 758–62(1915).
E. J. C.

Accident prevention in the chemical industries. F. W. KEOUGH. *Met. Chem. Eng.* **13**, 731–4(1915).—An address.
E. J. C.

Salt systems of oceanic salt deposits (D'ANS) 8. Ammonia as a by-product in sugar factories (DONATH) 28.

BLÜCHER, H.: **Auskunftsbuch für die chemische Industrie.** 9 Aufl. Leipzig: Veit & Co. 1459 ss. 18 M.

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U. S., 1,154,640, Sept. 28. W. S. LANDIS. **Making ammonia from commercial calcium cyanamide.** The $CaCN_2$ is fed into a vessel of H_2O and stirred with it to form a slurry and the latter is intermittently treated with steam. During the intervals when steam is not supplied the reaction proceeds exothermically and the NH_3 formed is recovered before adding more steam.

U. S., 1,154,949, Sept. 28. F. VON OEFELE. **Compounds of vanadium and selenium** of the formulas V_2Se (white), V_2Se_2 (yellow), V_2Se_3 (red), V_2Se_4 (dark blue), V_2Se_5 (green), V_2Se_8, $KSeVO_2$, $(VO_2)SeH$ and KSeVO are formed by heating oxides of V and Se with C, SO_2 or HCl with or without alkalies.

U. S., 1,154,980, Sept. 28. A. EXBRAYAT. **Agglomerating ores, coal, etc.** The material is treated with an alk. soln. of fuchsine or gelose prepd. by treating seaweed with hot H_2O or steam and alkalies, mixed, molded into blocks, dried and then passed through a bath prepd. from seaweeds and soap soln., again dried and treated with a soln. of a sol. Al salt to form a H_2O-proofing of insol. Al soap. Small amts. of coal tar or pitch may be added to preserve the binder and an oxidizing salt, *e. g.*, $KClO_4$, to accelerate combustion.

U. S., 1,155,605, Oct. 5. H. K. MOORE. **Dry calcium hypochlorite** is made by chlorinating powdered $Ca(OH)_2$ on hollow shelves while cooling it to below the freezing point of H_2O by circulating brine through the shelves to prevent balling of the product and maintain it in powdered condition.

U. S., 1,155,045, Sept. 28. B. H. CRAM. **Apparatus for making oxygen.** Alkali metal manganate or permanganate is placed in retorts and alternately treated with steam and air at high temp. Material in one set of retorts is regenerated while O is produced by the action of steam in the other series.

U. S., 1,155,054, Sept. 28. P. H. FRANZ. **A felt friction material for use in brake bands, etc., is made by** shrinking felt fabric to the desired form, impregnating it with a soln. of shellac 30 lbs., resin 12 lbs., alc. 5 gals. and turpentine 3 gals., and drying.

U. S., 1,155,057, Sept. 28. M. GRUNZWEIG. **Expanding cork** particles (*e. g.*, for use in making "cork stone"). The particles are moistened and then introduced into a chamber in which they are suddenly heated to about 400° or lower temp., above 100°, while being agitated.

U. S., 1,155,840, Oct. 5. O. SERPEK. **Fixing nitrogen.** A mixt. of ferro-Al with C and bauxite is heated to 1200–1300° and treated with N. At this temp. the N combines with the ferro-Al and the heat of the exothermic reaction ensuing causes a rise in temp. to about 1800–1900° at which point fixation of N on the Al in the bauxite takes place.

U. S., 1,156,081, Oct. 12. G. HOPP. **Safety stair-treads, etc.,** are made by applying a mixt. of abrasive material with a phenolic condensation product to a metal base plate and hardening the mixt. by heat and pressure.

U. S., 1,156,107, Oct. 12. H. SPECKETER and G. MÜNCH. **A relatively pure anhydrous sodium hyposulfite** is produced by mixing aniline with aq. Na hyposulfite soln. and evapg. the soln. to dryness *in vacuo* while constantly agitating. The amt. of aniline used is preferably greater than that of the H_2O to be evapd. The aniline combines with any SO_2 formed during evapn. and the aniline sulfite and aniline are distd. from the hyposulfite.

U. S., 1,156,108, Oct. 12. A. C. SPENCER and K. P. MCELROY. **Making cyanides from producer gas and potash-bearing and other alkaliferous minerals.** An ignited charge of greensand, feldspar or camptonite rock and limestone, containing sufficient

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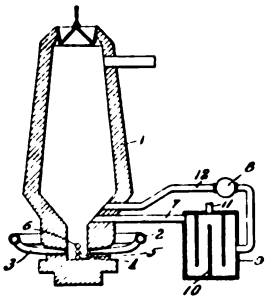


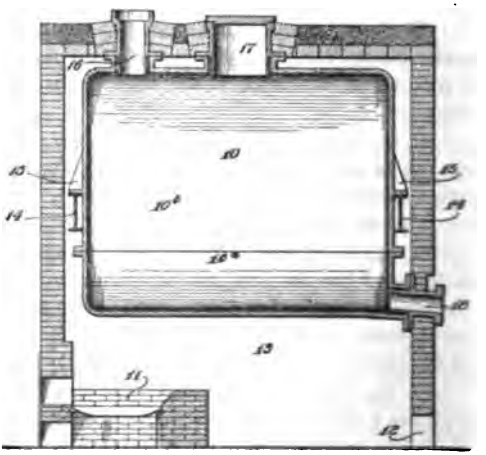
Fe so that some metallic Fe will be produced in the reaction, mixed with coke, is passed downwardly through the blast chamber *1* while air is forced through the pipes *2* and *3*. A current of vapors and gases is withdrawn from the high temp. zone through the pipe *7* and alkali cyanide is collected in the condensing chamber *9*. The residual gases are then returned to the reaction chamber. Molten Fe, slag and cyanide are drawn off through the openings *4*, *5*, and *6*, resp.

U. S., 1,156,388, Oct. 12. J. A. BRADBURN. **Potassium chloride** is obtained from natural saline waters such as Great Salt Lake water by refrigerating the water to cause crystn. of most of the Na_2SO_4, sepg. the crystals, adding $MgCl_2$ to the liquid and concg. it to effect crystn. of NaCl, removing the latter, cooling the liquor to cause sepn. of crude KCl crystals and sepg. and washing the latter to purify them.

U. S., 1,156,452, Oct. 12. L. H. BAEKELAND. **An insulating composition for impregnating electric coils,** immiscible with H_2O and having high dielec. properties, is prepared by mixing a solid initial condensation product of PhOH and CH_2O with about 30–40% its wt. of $C_{10}H_8$ or similar solid solvent and about 15–30% of a liquid solvent of high b. p., *e. g.*, $PhNO_2$, nitrotoluene, xylene, toluene or cumene.

U. S., 1,156,509, Oct. 12. E. WEINTRAUB and L. B. MILLER. **A microphone** is made with conductive granules of carbonized phenolic condensation product. The granules have a hardness of 6 or more on Mohs scale and give clearer enunciation and slower increase of resistance than the ordinary C granules.

U. S., 1,156,595, Oct. 12. W. E. FLETCHER. **A retort-furnace for distilling nitric acid.** The retort *10* with charging openings and outlets *16*, *17* and *18* is heated by hot combustion gases in the expansion chamber *13* passing from the fire-box *11* to a flue. The main heating, effecting deterioration of the retort, is at the bottom and the lower portion of the retort *10a* is made separable and renewable.



U. S., 1,156,662, Oct. 12. J. A. BRADBURN. **Preparing magnesia from dolomite.** Calcined dolomite is mixed with H_2O and the hydrated mixt. is combined with NaCl and NH_4Cl and the soln. subjected to distn. to obtain NH_3. The remaining liquor is treated with fresh calcined dolomite which effects pptn. of $Mg(OH)_2$ and sepn. of MgO from the dolomite. The $Mg(OH)_2$ and MgO are separately collected from the soln. by filtration and the $Mg(OH)_2$ is calcined.

U. S., 1,156,742, Oct. 12. G. G. BLARDONE, C. W. NICHOLS and F. BRUGUIERE. **A substitute for lampblack** is formed by charring and pulverizing rice hulls and chaff.

U. S., 1,157,253, Oct. 19. M. PIER. **Synthetic manufacture of ammonia** is effected by bringing together H and N, using a catalyst formed by rendering alk. a soln. of chloride of Ir or Rh and combining the resulting ppt. with a carrier of alk. earth oxide or carbonate.

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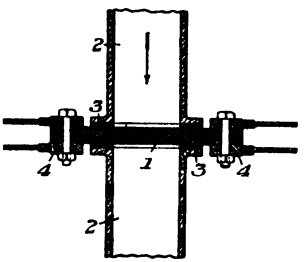
U. S., 1,157,293, Oct. 19. C. J. BROCKBANK. **An apparatus for the catalytic manufacture of sulfuric acid,** or other products, is formed with a porous diaphragm *1* of compacted carborundum carrying Pt or other active catalyzer in its interstices. The diaphragm is heated electrically from the electrodes *4* and SO_2 and air are passed through it in the tube *2* at a temp. of 400–800°. Formation of H_2SO_4 is very rapid and complete.



U. S., 1,157,436, Oct. 19. H. SPENCE and T. J. I. CRAIG. **Solutions of sodium aluminate** are stabilized by the addition of about 0.5–1.5% of sugar, dextrin, starch, glycerol or saccharate, which inhibit the pptn. of $Al(OH)_3$. Cf. *C. A.* 9, 698.

U. S., 1,157,437, Oct. 19. A. C. SPENCER. **Recovery of potash from igneous rocks containing feldspathoid minerals** is effected by heating the finely divided rock, *e. g.*, leucite or nephelite syenite, to about the sintering temp. with CaO (with or without $CaCl_2$) in sufficient amt. to replace the K_2O and form di-Ca silicate but not sufficient to form tri-Ca silicate (after allowing for the formation of tri-Ca aluminate and tri-Ca ferrite); the heating is continued until the K_2O or KCl liberated is fumed off and recovered.

U. S., 1,157,455, Oct. 19. E. TAYLOR and F. P. BERGH. **Sulfuric acid** is made catalytically by injecting finely divided Fe oxide or other catalyst into a chamber containing a circulating mixt. of O and SO_2, controlling the temp. of the reaction by the introduction of air, and returning the catalyzer which seps. and injecting it again into a succeeding charge. Less catalyzer is necessary than when used as a stationary mass.

U. S., 1,157,493, Oct. 19. W. R. BARDSLEY. **Metallic dies for use in embossing** are formed by coating a metal surface, *e. g.*, Zn or Cu, with an albumin soln., drying in subdued light and applying an ink impression, then applying a fine, opaque powder, *e. g.*, dragon's blood, to the plate and exposing to the light for a sufficient time to render the sensitized soln. on the plate insol. in H_2O, washing with benzine, C_6H_6 or turpentine to remove the ink and powder from the plate, coating the surface with lithograph transfer ink, immersing in clear H_2O and washing off the portions which have not been exposed to light, then applying etching powder, heated until the powder melts and etching the plate.

U. S., 1,157,530, Oct. 19. F. D. HARPER. **Precipitated manganese dioxide** is pressed in a mold to give it about the same density as the native mineral MnO_2 and is then ground, to prepare it for use.

U. S., 1,157,662, Oct. 26. H. ARNOLD. **Fire-proof utensils** are made from a paste of rare earth oxide, *e. g.*, oxides of Zr, Th, Be or TiO_2, mixed with a small amt. of free mineral acid and a dil. colloidal soln. of hydroxide of the metal, the oxide of which is used in the paste. The mixt. is molded and then calcined, at 1600–2100°.

U. S., 1,157,668, Oct. 26. J. H. BONER. **Producing chromium salts from ores.** Chrome ironstone is heated with C or CO and Cl and the $FeCl_3$ is eliminated by volatilization.

U. S., 1,157,669, Oct. 26. C. BOSCH and W. WILD. **Hydrogen** is produced by removing part of the CO from water gas and treating the residual gas with steam under a pressure of about 60–600 lbs. per sq. in. while subjected to the action of a catalyzer. The H may immediately be used under its original pressure in making NH_3. More H is obtained and the reaction is accelerated by producing the H under high pressure. Cf. *C. A.* 9, 129.

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U. S., 1,157,935, Oct. 26. C. E. GRAY. **Desiccating milk or other liquid mixtures or solutions.** The liquid is mixed with fine particles of desiccated product on which it forms a coating while suspended in a cloud or atomized spray with the solid carrier. Then the film of liquid on the carrier is desiccated by a current of dry air. The finer particles are sepd. from the finished product and the larger particles are pulverized and used as nuclei for another operation.

U. S., 1,157,959, Oct. 26. J. F. PLACE. **Process of liquefying air and separating its constituents.**

U. S., 1,158,167, Oct. 26. C. BOSCH and A. MITTASCH. **Producing ammonia catalytically** from N and H. The gases are passed over pure Fe oxide at a temp. of 600° and the flow of gas is continued after the oxide has been reduced to metal by the action of the H.

U. S., 1,158,181, Oct. 26. E. COLLETT. **Concentrating dilute nitric acid.** In removing H_2O from HNO_3 vapors by the action of H_2SO_4, conc. HNO_3 is introduced into the material under treatment, below the top of the drying tower, to prevent too great a rise in temp.

U. S., 1,158,245, Oct. 26. J. E. LAPPEN. **Flax straw** for the manuf. of felted heat-insulating sheets is immersed in degumming soln. freely moved about in the soln. and beaten and hackled while immersed to prevent breaking the fiber and facilitate the degumming. The fiber, shives and incrusting substances are then sepd. and a portion of the shives is recovered together with the fiber.

U. S., 1,158,265, Oct. 26. K. E. OLSON. **Imitation gold leaf** or other colored leaf is prepared by spraying on a sheet of glass a soln. of wax in a volatile solvent, driving off the solvent, spraying a film-forming soln. or mixt., *e. g.*, a mixt. of nitrocellulose soln., gum elemi and bronze powder, on the wax-covered glass and stripping the film from the glass after it has formed.

U. S., 1,158,366, Oct. 26. D. H. BIBB. **Briquets of ore, flue dust, etc., are formed** with a binder produced by evapg. waste sulfite liquor until a pitchy residue sol. in H_2O remains, pulverizing this pitch and molding briquets of a moistened mixt. of the binder and main body material. The molded briquets are then treated as in pat. 1,158,364 *C. A.* **9**, 3216.

U. S., 1,158,379, Oct. 26. A. E. GESSLER. **Green chromium oxide** is produced by igniting a mixt. of $Na_2Cr_2O_7$ 53, S 10 and $NaClO_3$ 1.25 parts and lixiviating the product remaining after complete combustion is effected.

Aust., 290, Jan. 12, 1914. SÄRVÄRER KUNSTSEIDENFABRIK AKT.-GES. Simultaneous manuf. of **hydrogen sulfide and the sulfides of the alkalies or alkaline earths** by heating residues containing substances with S content and having a reducing action, after admixt. with hydroxides or carbonates of the alkalies or alk. earths.

Brit., 11,094, May 5, 1914. SOC. L'AIR LIQUIDE (SOC. ANON. POUR L'ETUDE ET L'EXPLOITATION DES PROCEDES G. CLAUDE). **Drying and cooling compressed air or gas,** *e. g.*, water-gas, by heat-interchange with the cooled expanded air or gas, by causing the latter to descend tubular passages while the compressed gas ascends a confined space around them. The compressed gas is caused by baffles to follow a nearly horizontal sinuous path. The point of 0° temp. where the greatest deposit of moisture occurs, is momentarily shifted upwards, allowing the hoar frost to melt, by allowing the compressed gas to enter at a higher temp. than usual, *e. g.*, by eliminating the cooling in the last stage of compression for a time.

Brit., 11,112, May 5, 1914. MEIROWSKY & Co. and M. MEIROWSKY. In **mfg. insulating materials,** sheets of paper or other fibrous material are satd. with oil and

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coated with resin and then compressed or rolled together. The material may be used for elec. insulation or for storing or conducting corrosive liquids.

Brit., 12,454, May 20, 1914. J. CADMAN. An **absorbent material for removing carbon dioxide from air** and particularly for use in breathing app., consists of a porous vehicle, such as coke or charcoal, which, by immersion in molten alkali such as NaOH, has acquired a coating or film thereof. A cooling material such as $CaCl_2$ may be added to the alkali to prevent heating of the air.

Brit., 13,479, June 2, 1914. CHEM. FABRIK RHENANIA, C. THELEN and F. WOLF. In mfg. **alkali sulfates**, the first stage of the reaction between H_2SO_4 and an alkali chloride is effected in a pear-shaped pan closed by a lid and having a rotary stirrer which, when rotated in one direction, mixes the charge and in the other direction discharges it through a connection into a muffle furnace in which the second stage is effected. The muffle is provided with stirring devices which move the charge in a spiral path from the central inlet to a circumferential exit. For the process of mfg. sodium sulfate see Ger., 279,997 (*C. A.* **9**, 1233).

Brit., 13,594, June 4, 1914. J. PRIGGE. **Etching plates** which are supported over the etching fluid, by spraying the fluid up on to the plate by scatterers in the fluid while agitating the whole surface of the fluid so that particles are scattered from the whole surface and an air gap is maintained between the surface and the plate. Means are provided to adjust the level of the fluid to maintain the distance of the plate above the fluid constant.

Brit., 13,642, June 5, 1914. P. L. PFANNENSCHMIDT. App. for **concentrating acids** comprizes a series of open pans arranged in a cascade and heated by the waste gases from a furnace, a chamber containing a number of perforated plates and placed on a hot plate of the furnace, and cooling chamber similar in construction to the chamber containing the perforated plates. Each of the open pans has a number of transverse ridges to cause the acid to follow a sinuous course, and a lip overhanging into the next pan. The acid from the last pan of the cascade passes into a tray provided with traps, and then falls through the perforated plates first mentioned, where it meets an ascending current of air which has been heated by passing through the cooling chamber aforesaid and the furnace pipes. The concd. acid collects in a trapped tray and passes by a shoot to another trapped tray; it then falls through the perforated plates aforesaid and is cooled by an ascending current of cold air.

Brit., 13,687, June 5, 1914. BADISCHE. In the catalytic oxidation of NH_3 to **nitrogen oxides**, the **catalyst**, consisting of 1 or more oxides of the metals of the Fe group, is employed in sep. pieces or lumps. It is advantageous to heat the pieces or lumps to 600–800° before use, to prevent sintering of the contact mass in the tube or furnace. The catalyst may be prepd. by breaking up an oxidized melt (obtained by burning metal powder), or by forming the pptd. hydroxides into suitably shaped pieces, or by breaking up sufficiently pure ores, or by oxidizing pieces or lumps of the metal, or by calcining decomposable salts of the metal such as the nitrate, and breaking up the mass; by this method a porous catalyst is obtained. Substances such as S, H_3PO_4, H_3BO_3, SiO_2, and alkali should not be present in the gases or in the catalyst.

Brit., 13,842, June 8, 1914. FARBW. v. M. L. & B. **Nitric acid** of a strength exceeding that of the acid of the lowest vapor pressure, such as that obtained by the process described in 15,948, 1911 (*C. A.* **7**, 223), is concd. without the aid of a desiccant by heating it, leading the resulting vapors to a fractionating column maintained at the requisite temp., and condensing the vapors which pass over. The dil. acid may be continuously admitted to the column, and the residual liquid run off from the column to the boiling vessel, whence it emerges as acid of the lowest vapor pressure.

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In an example, 78% acid is treated in a column maintained at 100° for the production of 97% distillate. A lower temp. is used when the operation is effected under reduced pressure.

Brit., 13,848, June 8, 1914. BADISCHE. **Catalytic agents for use in the manuf. of nitrogen oxides** by the oxidation of NH_3 consist of mixts. of any 2 of the following classes of substances: oxides of metals of the Fe group; oxides of the rare-earth metals; oxides of Bi. In examples, catalysts are prepd. by (1) pptg. with NH_3 a soln. containing $BiONO_3$ and ferric or Mn nitrate or both of the latter, (2) melting Fe powder in the presence of O and Bi oxide, (3) pptg. with NH_4OH or Na_2CO_3 a soln. containing ferric and La or Yt nitrates, or Mn and C nitrates, or Mn, ferric, and Di nitrates, (4) pptg. with NH_4OH a soln. containing Ce, NH_4, and Bi nitrates, mixing a part of the ppt. with CaO, MgO, Al_2O_3, or other binding agent, and adding the mixt. to the other part of the ppt. Cf. *C. A.* 9, 2577.

Brit., 14,226, June 12, 1914. E. HUNEBELLE. **Obtaining pure zinc oxide.** See Ger., 275,703 (*C. A.* 8, 3246).

Brit., 14,230, June 12, 1914. DEUTSCHE GASGLÜHLICHT AKT.-GES. **A gas-tight membrane** consists of an oiled sheet or skin of bacteria, Hyphomycetes, or other accretion of microörganisms formed upon wort or other substance. After being washed, the skins have the superfluous H_2O expressed, and they are treated either directly with oil or with an emulsion of oil and an albumin soln. Linseed oil and animal glue may alternately be employed, and a small quantity of non-drying oil, such as vaseline oil, may be added to prevent cracking. The emulsion is preferably formed by addition of linseed oil soap and a few drops of alc. potash. Glycerol or soft soap may be added to confer flexibility. After the treatment with oil or emulsion, the membranes are squeezed, dried in the air, and varnished if required to be water-proof. They may be rendered gas-tight and strong by mercerization before the oil or emulsion treatment, and they may be combined with fabrics in the known manner. Several membranes may be caused to adhere together.

Brit., 14,340, June 15, 1914. W. JANENSCH. **In mixing, stirring, and aerating liquids, powders,** etc., and dissolving powders, etc., by means of an intermittent current of air or liquid drawn or forced through a downwardly tapering vessel at its lower end, the contents of the vessel are allowed to subside between the pulsations. The pipe may be tapered downward and it may be disposed within the vessel, or outside it, following its curve downward to the bottom. Cf. *C. A.* 9, 2439.

Brit., 14,357, June 15, 1914. SOC. ANON. DES POUDRES ET NITRATES. **Nitric acid** is obtained by the action of superheated steam on briquets of mixts. of $NaNO_3$ or KNO_3 and Al_2O_3 or bauxite. The reaction may be facilitated by the addition of $CaCO_3$ to the mixt.; aluminates, *e. g.*, raw aluminate previously obtained in the process, may be added to improve the porosity of the charge; Ba or Sr compds., such as the oxides, carbonates, nitrates, acetates, or carbides, may be added to render insol. any SiO_2 present. The aluminate resulting is dissolved out by H_2O and may be converted into Al_2O_3 by known processes. The HNO_3 may be passed into towers in which a countercurrent of NH_4OH or other base circulates to give NH_4NO_3 or other nitrate.

Brit., 14,393, June 15, 1914. ELEKTROCHEM. WERKE GES. App. for **obtaining large crystals.** See Ger., 273,929 (*C. A.* 8, 2788).

Brit., 14,433, June 16, 1914. A. BARBERIS. **Lubricating packing for shafts** and journals is made by treating waste residues of cotton, wool, cellulose, or other fiber with substances which render them incombustible and impermeable, thus securing economy of lubricant. The packing is first soaked in a soln. of 100 g. of alum, NH_4 phosphate, $ZnSO_4$, borax, $MgSO_4$, Na_2HPO_4, K_2HPO_4, Na tungstate, NH_4 tungstate, Al

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acetate, NH_4ClO_3, or similar salt, in 1000 g. of H_2O. After pressure, the packing is soaked in a second bath consisting of 1000 g. of H_2O, 20 g. of H_3BO_3, 30 g. of gelatin, 40 g. of glycerol, 4 g. of a 36% soln. of HCHO, and 100 g. of oo graphite. The two baths may be combined.

Brit., 14,453, June 16, 1914. W. G. LITTLE and H. MORRIS. **A composition for destroying animal parasites** consists of a mixt. of soap and alkali arsenite made by mixing the molten materials or hot concd. solns. so as to give a solid mass on cooling. The product is ground or otherwise subdivided. The preferred ingredients are castor oil soap and 70–5% of Na arsenite.

Brit., 14,963, June 23, 1914. C. E. CHALLIS. **A cleaning and polishing composition** consists of kieselguhr, pumice, rotten-stone, emery or CSi, Vienna or Neuberg chalk or pptd. chalk, coloring oxide such as yellow ocher, rouge, roasted Fe_2O_3, or Mn oxide, $(NH_4OCO)_2$, a mixt. of olive-oil soap, coconut-oil soap, cottonseed oil soap, and tallow soap, oleic acid, and Russian turpentine or other deodorant. It is preferably used in a polishing cloth.

Brit., 15,038, June 23, 1914. W. G. F. SIEGMANN. **A fire-proof, water-proof, and acid-proof plastic composition.** See U. S., 1,102,358 (*C. A.* 8, 2935).

Brit., 15,053, June 23, 1914. SOC. L'AIR LIQUIDS. **Freeing gases from carbon dioxide** present as impurity by subjecting them first to a physical purification by soln. under pressure in H_2O, and then to a chem. purification by the action of a suitable reagent dissolved in the H_2O, the process being carried out in one app. and by means of one vol. of H_2O. The process is particularly applicable to the removal of CO_2 from air or other gases containing it, such as water-gas or water-gas modified by catalysis or by passage over hydrated lime, prior to liquefaction of the gas. The process is effected by bringing the compressed gas into contact with a counter-current of H_2O in a tower, at the upper portion of which is introduced a small quantity of a suitable reagent, such as lime or NaOH. The dissolved gas may be subsequently removed from the liquid by relieving the pressure thereon, and, when lime is used, the pptd. carbonate may be filtered off and the H_2O returned to the tower.

Can., 164,838, Sept. 14, 1915. F. M. BECKET. **In the manufacture of calcium carbide,** the process of prepg. aggregates suitable for furnacing, by mixing lime with coking coal in such proportions that the fixed C of the coal will substantially suffice for the reaction, the coal being sufficiently rich in bituminous matter to yield with the lime, under ordinary coking conditions, a mechanically strong aggregate suitable for furnacing, and then coking the mixt. Cf. *C. A.* 9, 1584.

Can., 164,839, Sept. 14, 1915. F. M. BECKET. **The process of fixation of nitrogen** by heating a mass containing ferro-aluminium in a current of N and adding CaC_2 to the mass.

Can., 164,857, Sept. 14, 1915. W. S. LANDIS. **The process of oxidizing ammonia** by providing a mixt. of air and NH_3 containing sufficient O to make the subsequent reaction self-sustaining, and subjecting the mixt. to the action of a catalyzer.

Can., 164,858, Sept. 14, 1915. W. S. LANDIS. **Process of oxidizing ammonia** by subjecting a mixt. of NH_3 and O to a cooling action, and passing the cooled mixt. through a catalyzer.

Can., 164,971, Sept. 21, 1915. GEO. WEINTRAUB. **Process of making boron nitride** by heating a mixt. of material containing B and a cyanide to a temp. at which reaction occurs and continuing the reaction until products other than BN are volatilized.

Ger., 283,329, Dec. 22, 1913, and 283,423, May 29, 1913. INTERNATIONALE FEUERLÖSCHER-GES. M. B. H. **Constructional details of a dry fire extinguisher whereir**

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the extinguishing powder is expelled through a nozzle attached to the side of the container.

Can., 165,060, Sept. 21, 1915. O. T. THORSSELL. **Production of ammonia** by heating $Ba(CN)_2$ with H_2O in an autoclave; $Ba(HCO_3)_2$ also is obtained. The lixivium, obtained by the reaction in the autoclave and containing $Ba(HCO_3)_2$, is treated with Na_2CO_3 to ppt. $BaCO_3$ and form HCO_3Na in the soln. The latter is evapd. *in vacuo* for the purpose of obtaining a salt forming the starting point for the production of $(CO_3Na)_2$.

Ger., 283,847, Apr. 5, 1913. W. L. HARRISON. **Piston packing for fire extinguishers.** See U. S., 1,106,144 (*C. A.* **8**, 3223).

Ger., 284,053, Nov. 5, 1913. FRANKFURTER MASCHINENBAU AKT.-GES. v. POKORNY & WITTEKIND and E. SEYDAACK. **Evaporating high boiling liquids, such** as acids, lyes, and the like, with the employment of a highly heated liquid, such as oil. A suitable app. is specified.

Ger., 284,255, Sept. 10, 1913. R. SCHRÖTER. In mfg. **insulating bodies** from peat and a binder, such as tar pitch, porous, anhydrous, long-fiber peat is subjected while heated in a revolving drum to the action of cold and moist compressed air mixed with pulverulent binder, and then formed in presses. In detail, the peat is first acidified, exposed to the air, and dried. Then it is shredded to obtain a long fiber mass. The peat treated in this manner is exposed to a current of hot air and roasted thereby. The anhydrous heated peat is then placed in a revolving drum and compressed cold moist air, mixed with atomized tar pitch, is introduced. The desired form is given to the final product by cold or hot pressing of the mass.

Ger., 284,398, Oct. 29, 1911. F. M. MEYER. **Continuous manufacture of barium sulfide** from $BaSO_4$, whereby $BaSO_4$, in admixt. with coal, is charged into a revoluble furnace from the same side where the combustible gas is introduced, so that the product of reduction and the fire gases proceed in the same direction. If the process be carried out so that the final temp. is 800–900°, the $BaSO_4$ will be reduced almost quant. From the CO_2 and the added C, CO is formed. This can be returned to the furnace and burned as a source of heat. The endothermic character of the process in the furnace permits the introduction of the gases at the highest temp. If, however, other material is present which is decompd. during the endothermic process, the temp. should not exceed the final temp. in the furnace. In this manner the fusion of the reaction mass is avoided, and the process progresses smoothly and economically with respect to both labor and fuel. Coal, in particular, is saved, inasmuch as the reaction products, by their combustion, yield the temp. required to maintain the reaction. An excess of gas is obtained, which may be used for other purposes, as for driving motors. The resulting BaS is of loose texture, easily extd., and without BaO, while the gases are free from S and poor in CO_2.

Ger., 284,410, Dec. 3, 1913. CHEM. FABRIK VON HEYDEN, AKT.-GES. **Extracting fats** of all kinds, **hydrocarbons, sulfur,** and the like, with the use of the neutral phosphoric acid esters of the phenols and substituted phenols, especially the cheap tricresyl phosphate and its substitution products as the extg. agent. The extn. is made with hot solvent. The sepn. of the dissolved substances from the resulting soln. is effected by cooling of the soln. and the mechanical sepn. of the deposited products or by distn. under reduced pressure. If vulcanized rubber be digested with tricresyl phosphate, the S dissolves, while the rubber remains as an elastic mass.

Ger., 284,458, Aug. 17, 1913. A. DELLING. **Bleaching,** or lightening the color of, **dark tobacco leaves,** by treating them first with H_2O_2 and then with a H_2O_2 soln. acidified with a suitable acid. Citric or other organic acids are preferred, although

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HNO_3 may be used. Sumatra and Java tobacco are most suited to the treatment. *E. g.*, tobacco 1.75 kg. is treated, for 36 hrs., with 5 kg. of a 12 vol. % H_2O_2 aq. soln. The treated leaves are then rinsed with H_2O and again treated for 12 hrs. with 5 kg. of an aq. soln. containing 12 vol. % H_2O_2 and 0.1% tartaric acid, at the ordinary temp.

Ger., 284,531, Dec. 7, 1912. Gebr. Giulini. Mfg. **aluminium nitride.** See Fr., 463,232 (*C. A.* 8, 2464).

Ger., 284,532, Dec. 25, 1912. A. Messerschmitt. Mfg. **hydrogen from steam.** See U. S., 1,109,447 (*C. A.* 8, 3490).

19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

Artificial daylight for the microscope. Simon H. Gage. Cornell Univ. *Science* 42, 534–6(1915).—G. mentions a glass filter (made by H. P. Gage at the Corning Glass Works) which will render the light from a N-filled W lamp almost exactly like daylight. The compn. and construction of the glass filter are not given. L. W. Riggs.

Ceramic bodies. W. Pukall. *Sprechsaal* 48, Nos. 13–20(1915).—Two groups of white bodies are made in which RO = 0.3 K_2O, 0.7 CaO in one and 0.7 K_2O, 0.3 CaO in the other. In both, Al_2O_3 varies from 0.33 to 7 and SiO_2 from 2 to 30. Test cones of mixts. were burned to cones 7, 12, 14 and 16. At cone 7 high alkali gives grayish stoneware appearance. At cone 12 both groups were porcelain-like. The field of softened mixts. was nearly the same in the two series. The use of the tables for compounding new bodies is shown. R. K. H.

Saltpeter replacement in the enamel industry. C. Tostmann. *Keram. Rundschau* 23, 15(1915).—Oxidizing agents which might replace KNO_3 are too expensive or depend upon it in manuf. Reduction may be prevented by good draft in the furnace. Use of SnO_2 or ZrO_2 instead of Sb_2O_5 lessens the need of KNO_3. T. reports success in the use of NaCl to remove Fe. R. K. H.

Saltpeter replacement in the enamel industry. F. Kraze. *Keram. Rundschau* 23, 5–6(1915).—K. gives BaO_2 as the best substitute. He suggests the use of NaCl to remove the Fe by forming volatile chlorides. R. K. H.

Refractories for lime kilns and pulp driers of sugar factories. The Crummendorf quartz schists as a natural substitute for fire brick. Hugo Richter. *Z. Ver. Zuckerind.* 65, 263–73(1915).—Comments on criticisms of R.'s previous work (cf. *C. A.* 8, 2235) and a few additional results. The Crummendorf schists are very fine-grained, contain 95–96% SiO_2, and are exceptionally uniform as to structure and impurities. On heating, some samples contract, others expand slightly. The stone is furnished in rough or sawn blocks and is used directly as a refractory material. Sixty factories use it in place of firebrick and find that it lasts about 3 times as long.
W. L. Badger.

How to prevent efflorescence in finished brick-work. Arthur E. Williams. Univ. of Ill. *Brick and Clay Rec.* 47, 341–2(1915).—W. gives the causes for the production of efflorescence or "whitewash" on brick during the burning and cooling of the ware. Factors which will assist in avoiding the formation of the sulfate salts are: (1) making as dense a body as possible; (2) burning with a smoky atm., which, of course, can be done only in accordance with the final color desired, (3) picking S rock from the coal and clay as much as possible, and (4) cooling in an atm. free from S. A large proportion of wall white may be attributed to sol. salts in the earth or the mortar. The

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sources of sol. salts other than the brick themselves are (1) the lime, (2) cement, (3) sand, (4) iron ore mortar color, especially that made by roasting pyrite, (5) salt used to prevent freezing, (6) soil about the foot of buildings, (7) manure, and (8) in large cities its presence has been explained as coming from the soot depositing on the wall. The sol. sulfates in the mortar as well as the clay should be rendered insol. by the addition of Ba compds. A simple method of detg. whether or not the burned brick will effloresce is to place a few samples on end in water, about half immersed. If they contain sol. salts, the dry end of the brick will show efflorescence in a few days and at least within a week. Distd. water should be used for this test. Similar tests with the brick set in the ground soil, the mortar, and the tap water may be made to det. the possibility of the appearance of efflorescence from these sources. ROBT. BACK.

The design and construction of down-draft kilns. A. F. GREAVES-WALKER. *Brick and Clay Rec.* 47, 343–7; 5 figs., 427–30; 2 figs. (1915). ROBT. BACK.

Drying of clay wares. ELLIS LOVEJOY. *The Clayworker* 64, 276, 4 figs., 390–1, 448–51(1915); cf. *C. A.* 9, 1679, 2974.—In Part 18, L. continues with descriptions of waste heat progressive driers. In Part 19, L. begins the calcns. for detg. air volume and heat requirement for waste heat driers. A typical problem is solved. ROBT. BACK.

Setting down-draft kilns. A. F. GREAVES-WALKER. *Brick and Clay Rec.* 47, 501–5(1915); 14 figs. ROBT. BACK.

Controlling temperatures in down-draft kilns. C. O. ARBOGUST. *Brick and Clay Rec.* 47, 591–3(1915). ROBT. BACK.

The setting of wall tile in the muffle. R. P. *Keram. Rundschau* 23, 9(1915). R. K. H.

Tile setting in continuous kilns. ANON. *Brit. Clayworker* 24, 84(1915).—Most roofing tile cannot safely be set over 6 ft. high; if the kiln is higher bricks must be set at the bottom. C. H. KERR.

The properties of technical porcelain of the Berlin Royal Porcelain Factory. REINHOLD RIEKE. Charlottenburg. *Z. angew. Chem.* 28, I, 374–6(1915).—Hard porcelain for mfg. purposes is in greater and greater demand. To a large extent development of chem. manufacturing can proceed only with development of technical porcelain. Much information is scattered through the literature. Data cover many products of many makers and detns. on one porcelain cannot be applied to another because of the influence of different compn., burning temp., methods of forming the ware, etc. Berlin technical porcelain has a d. of 2.64 when burned at 950° and 2.465 after usual final burn at about 1420°. Chem. compn. is not const. due to variation in raw materials. A typical analysis is: SiO_2, 67.5; Al_2O_3, 26.6; Fe_2O_3, 0.8; TiO_2, 0.4; CaO, 0.4; MgO, 0.3; K_2O, 3.3; and Na_2O, 0.7%. Of mechanical properties, but few measurements have been made. Compressive strength is about 4200 kg. per sq. cm. measured on 2.5 cm. cubes. Tensile strength and modulus of rupture are not well known but Hermsdorfer porcelain is stated to give 1300 to 2000 kg. per sq. cm. tensile strength. Elasticity consts. have not been detd. but the modulus of elasticity for Hermsdorfer porcelain is between 5000 and 7000 kilos per sq. mm. and Berlin porcelain is probably not very different. Absolute heat conducting capacity has not been detd. It is about 0.002 to 0.004 (somewhat greater than that of glass). Av. sp. heat of unglazed porcelain (cf. *C. A.* 8, 3844) is 0.202 for 20–200° and 0.221 20–400°. Coeff. of expansion (cf. *Keram. Rundschau* 22, 143(1914)) of unglazed pieces 50 cm. long gave the following results: 23–200°, 0.00000343; 23–400°, 0.00000353; 23–600°, 0.00000355; 23–700°, 0.00000356. Henning (*Ann. phys. chim.* [4] 22, 631 (1907)) obtained the following results: —191–16°, 0.00000177; —16–250°, 0.00000336;

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—16–500°, 0.00000364; —16–1000°, 0.00000434. The coeff. of expansion is not only lower than ordinary glass, stoneware, Marquardt mass, and MgO ware of Berlin manufacture, but also the increase of coeff. with temp. is less than with those materials. Therefore, Berlin crucibles can be placed directly over the Bunsen or blast without precautions. The exact statement of softening point cannot be made since the porcelain is a complex silicate mixture and has no definite softening or m. p. Softening changes with size and shape of test piece, time of heating, etc. Detns. on a strip 6 mm. thick and 80 cm. long supported at one end and extending into a furnace for a distance of 20 cm. showed deflections of the end of the bar as follows:

Temp.	Time of heat. Min.	Deflection—sinking of end of bar. Mm.
530–560°	60	0.0
600–610°	30	2.0
600–610°	60	4.0
700–710°	30	1.9
700–710°	60	3.9
800°	30	4.5
808–900°	30	14.0
1100°	2	20.0
1100°	4	41.0

In spite of this softening below 1000° the porcelain can be used even up to 1400°. The deformation cone is 30–31 (about 1680°). The glaze showed distinct softening at about 950°. Berlin porcelain is practically gas-tight. At ordinary and high temps. a tube with 2.5 mm. walls and 20 cc. outside diameter was evacuated to 30 mm. of mercury and heated in a Heraeus furnace. Both at 1200° and 1300° the vacuum was unchanged after 15 min. Elec. cond. at ordinary temps. is almost zero. The resistance is $100–200 \times 10^{10}$ megohms per cm. The resistance decreases rapidly with the rise in temp. Cond. at 80° is 300–400 times as great as at 16°. At about 300° it becomes a fair conductor. (Cf. *C. A.* 4, 1578; *Physic. Rev.* 27, 322(1908); *Z. Elektrochem.* 13, 969(1907).) Puncturing voltage of unglazed pieces 2.5 mm. thick av. 40,000 v. The dielectric const. according to H. Starke (*Wied. Ann.* 60, 629(1897)) is 5.75. High feldspar porcelain gave much higher values; for example, Seger porcelain burned to cone 9 gave 6.61 and a still higher feldspar porcelain gave 6.84. C. H. KERR.

Determination of alumina in silicates (SELCH) 7.

ROSENTHAL, E.: **Die technischen Eigenschaften des Porzellans.** Oldenburg: G. Stalling. $0.75.

U. S., 1,153,353, Sept. 14. H. C. STIEFEL. **Semi-opaque, semi-translucent glass** is made from sand 60, soda ash 15, PbO 15, $Ca(NO_3)_2$ 3.5, Mg phosphate 3.5, $MgCO_3$ 3.5 and alum 3.5 parts.

U. S., 1,153,748, Sept. 14. C. BARZNER. **An opaque enamel or glazing composition for use on sheet-iron, glass, etc.,** is formed of a vitrifiable mixt. as usually employed, mixed with about 5% of ZnS having luminous properties. The latter gives the glazing a phosphorescent property. Ordinary ZnS may be used for opaquing if a phosphorescent glaze is not desired.

U. S., 1,155,000, Sept. 28. O. A. MYGATT. **Colored glass-ware** is made by forcing layers of differently colored glass into a mold with raised and depressed portions of the desired design and after molding the outer surface is sand-blasted or treated with acid to remove a portion of the material and cause a blending of the colors.

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U. S., 1,157,569, Oct. 19. F. MOENCH. **Plating or decorating glass or ceramic ware with aluminium.** The ware is repeatedly treated with hot HF, heated to nearly a red heat, after neutralizing and washing, treated with melted Al which is rubbed on the surface and allowed to cool gradually.

U. S., 1,158,417, Oct. 26. L. R. DENNISON. **Glazing brick, terra-cotta** and similar materials. Hardening material is mixed with the body of the material before molding and a flame of sufficient intensity is applied to the surface of the articles that the surface material is fused and forms an integral glazed finish.

Brit., 11,214, May 6, 1914. G. A. MACBETH. **Mfg. snow-white glass** for elec. lamp shades, globes, etc., which will transmit light without the reddish or yellow color known as "fire." An Al compd., such as Al_2O_3, and a F compd., such as CaF_2, are added to the ordinary constituents for making clear glass. The wt. of the Al is greater than the wt. of the F. The period of heating is frequently less than 24 hrs. If the mixt. is heated too long, clear glass may be produced. Cf. *C. A.* 8, 2469.

Brit., 11,824, May 13, 1914. DYNAMIDON GES. **A lining for the sintering zone of a rotary kiln.** See Ger., 281,388 (*C. A.* 9, 2301).

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

Physicochemical and colloidal properties of concrete and reinforced concrete. P. ROHLAND. *Chem. Ztg.* 38, 1067–8(1915).—The reduction of rust in reinforced concrete is not due to the local action of elec. currents since a current of less than 0.003 amp. does no damage while over 0.003 amp. causes the formation of rust. When Fe and wet-set cement are brought in contact the closest observation detects no elec. action. Should impurities such as Si and Mn cause local action in contact with the cement this would not be sufficient to cause the general rust-reducing action which occurs. Other theories of rust reduction are reviewed. In testing the setting time of cement the needle was observed to penetrate some parts of the specimen while other spots showed the beginning of set. This is attributed to the fact that non-uniform speed of coagulation was caused by the presence of very small amts. of substances which can either retard or accelerate the set and which may form during the burning or storing.

J. C. EVANS.

Chemical similarities of hydraulic cements. G. B. UPTON. *Chem. Eng.* 21, 163–4(1915); see *C. A.* 9, 2137. A. J. PHILLIPS.

The value of high-pressure steam tests of portland cements. R. J. WIG AND H. A. DAVIS. Bur. Standards, *Tech. Paper* 47, 34 pp.(1915); see *C. A.* 9, 1984.

A. J. PHILLIPS.

Concrete aggregates. S. E. THOMPSON. *Trans. Intern. Eng. Congress* 1915 (advance copy)—A discussion is given of the aggregates of the U. S., economy in selection of aggregate, requirements for concrete, effect of the aggregate upon quality and strength of concrete and mortar and tests of quality and acceptance. A. A. KLEIN.

Volume changes in concrete. A. H. WHITE. Univ. Mich. *Trans. Intern. Eng. Congress* 1915 (advance copy).—A discussion is given of vol. changes in neat cement, mortar and concrete when kept continually immersed in H_2O, kept continuously in air, when alternately wetted and dried. Other phenomena are discussed, *viz.*, the effect of moisture on the strength of concrete; differential expansions of mixts. of different richness; coefficient of thermal expansion of concrete; effect of high temp.; effect of freezing; effect of vol. changes in concrete both protected and exposed to the weather. The smallest vol. changes are found in lean, porous concrete made from aged cements

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and stony aggregates, *i. e.*, brick, limestone and granite. To obtain the greatest uniformity in massive concrete and to prevent horizontal cracks, there must be an uninterrupted deposition of the concrete and an interlocking of the surfaces of the layers as deposited. For the preservation of detached concrete structures from the destructive influence of atm. agencies it is necessary to have a heavy facing on external wall surfaces and a water-proof cover for other open surfaces. A. A. KLEIN.

Time and shrinkage affect stresses and deflections of reinforced-concrete beams. F. R. MCMILLAN. *Eng. Record* **72**, 251–2(1915); cf. *C. A.* **9**, 1985.—Long time tests show continued increase in strains and deflections of beams and slabs.
A. A. KLEIN.

Concrete cut from actual specimens stronger than field-sample specimens. R. E. GOODWIN. *Eng. Record* **72**, 296–7(1915).—Compressive strength tests are given for 1:2:4 concrete made of different aggregates, consistencies and types of mixing. The specimens were made in the lab. and also cut from actual structures. The latter showed higher strengths. A. A. KLEIN.

Controlling raw mix in manufacture of portland cement. S. MCANALLY. *Concrete-Cement Age* **7**, *C. M. S.* 30–1(1915).—The following lab. method is suggested for use where content of MgO varies, since MgO can replace CaO in the constituents of cement, and therefore must not be disregarded in the calculations of raw mix. Procure a large sample of raw mix. Analyze for CaO (by $KMnO_4$ method) and MgO. Since a mix containing 42% CaO and 2% MgO is satisfactory it is advizable to control all mixes on this basis as follows: If collected sample contains more than 2% MgO, est. the MgO in the sample less 2% to the equiv. quantity of CaO and add the result to the actual lime in the mix; *e. g.*, suppose that the collected sample contains 41.50% CaO and 2.38% MgO; then 2.38%–2.00% MgO calcd. to CaO and added to actual CaO equals $(0.38 \times 56)/40 + 41.50 = 0.53 + 41.50 = 42.03\%$ CaO. The mixt., therefore, is 42.03% CaO and 2% MgO. If the collected sample contains less than 2% MgO subtract actual MgO in mix from 2%. Calculate to CaO and subtract from actual CaO in the mix; *e. g.*, suppose the analysis of sample gives 42.30% CaO and 1.72% MgO, then $42.30 - [(2.00 - 1.72) \times 56]/40 = 41.91$. The standard mix is 41.91% CaO and 2% MgO. Next analyze the standard mix by the acid-alkali method and note the lime equiv. in cc. of acid. Other analyses should be compared with this standard; the standard sample must be kept for standardizing new solns. A. A. KLEIN.

Mechanical grading of concrete sand. G. P. DIECKMANN. *Concrete-Cement Age* **7**, 68–9(1915).—Tensile strength and absorption tests were made on briquets of 1:3 mortar made with sands whose mechanical compn. was varied regularly. The results show that the best and most dense mortar for concrete is obtained if a sand has the following compn.: 5–10% passing 100-mesh; 20–30% passing 50-mesh; 40% passing 30-mesh; 60% passing 20-mesh; 80% passing 10-mesh and 100% passing 4-mesh. Plotting sieve against % passing sieve, the above figures give practically a straight line. A. A. KLEIN.

Load tests on concrete pipe. E. R. CONANT. *Eng. News* **74**, 556–7(1915).—Pipe was 1:2:4 using river sand and crushed granite with standard reinforcement. The max. load per lin. foot was 2.08 tons. A. A. KLEIN.

Probable and presumptive life of concrete structures made from modern cements. B. BLOUNT. *Trans. Intern. Eng. Congress* **1915** (advance copy).—The list of possible causes of destruction of ordinary concrete are bad cement, bad aggregate, bad proportions, bad mixing, bad workmanship, bad design, external violence, fair wear and tear, action of saline solns., action of acids, electrolysis. For reinforced concrete in addition to the above causes there are corrosion of reinforcement direct or by electrolysis and

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cracking due to monolithic character or possibly to stresses between the concrete and the reinforcement. Of the external causes of destruction the most important is the action of saline solns. The action of acids (notably H_2SO_4 and H_2S) is next in importance, and finally electrolysis is an important agency in destruction. A plea is made for rich, dense, impermeable concrete which is as impervious as possible to the entry of air and water. Electrolysis can be avoided by proper insulation. Any structure made well and honestly enough will vie in life with the mighty structures of antiquity.

A. A. KLEIN.

Use of wood and concrete in structures standing in sea water, with special reference to dock work. H. S. TAFT. *Trans. Intern. Eng. Congress* 1915 (advance copy).—The life and destructive action of *Teredo* and *Limnoria* are discussed. Data are given showing that the minimum probable life of wooden piles in water infested by borers is 6 mos., depending upon the location. Various methods of preservation are given and the life of the treated piles is noted. Cements suitable for sea water structures should be of the very best quality of fine pulverization, low in Al_2O_3, high in SiO_2, free as possible from gypsum, absolutely free from free lime, slow-setting and quickly hardening. Sand, gravel and stone should be of the best quality. Salt water should not be used for mixing unless fresh water is not obtainable. Many integral waterproofing compds. are of no value. Concrete should be rich, *viz.*, from 1:1.5:3 to 1:2:3. "Premolded, air-cured" concrete is much to be desired over that "cast enmasse-in-situ."

A. A. KLEIN.

Methods and equipment in the manufacture of hydrated lime. R. K. MEADE. *Concrete-Cement Age* 7, *C. M. S.* 13–17(1915); cf. *C. A.* 9, 1837—M. describes various processes for crushing the lime, mixing the lime with water and sepn. of hydrated from unhydrated lime.

A. A. KLEIN.

Preservative treatment of wood. W. B. CAMPBELL. *J. Soc. Chem. Ind.* 34, 257–8(1915).—A general discussion of the causes of the rotting of wood and of the methods of application of the ordinary preservatives.

A. J. PHILLIPS.

The use of carbide sludge for building purposes. K. SCHUMANN. *Chem. Ztg.* 39, 43(1915).—Waste carbide sludge from the manuf. of acetylene had the following % compn.: $CaCO_3$ 28.71, CaS 0.36, CaO 24.31, SO_3 0.03, Cl 0.01, Fe_2O_3 and Al_2O_3 0.88, SiO_2 1.29, H_2O 46.40, C 0.08, P_2O_5 0.06% and small amts. of MgO and alkalies. This sludge was mixed with 40% of sand and molded into building stones. The mortar was hard and the stones adhered firmly in 24 hrs.

J. C. EVANS.

Coal dust explosions in cement mills (HOLLY) 24.

GARY, M.: **Schwellung und Schwindung von Zement und Zement-moerteln in Wasser und Luft.** Berlin: W. Ernst & Sohn. $0.75.

MILLS, A. P.: **Materials of Construction.** London: Chapman and Hall. $4.75.

SCHEIT, H. AND WAWRINIOK, O.: **Versuche zur Ermittlung des Rostschutzes der Eiseneinlagen im Beton.** Berlin: W. Ernst & Sohn. $2.

WEINSCHENK, E.: **Die gesteinbildenden Mineralien.** 3rd ed. Freiberg: Herder. 261 pp. $2.50.

WHIPPLE, H.: **Concrete Stone Manufacture.** Detroit: Concrete-Cement Age Publishing Co. $1.

U. S., 1,153,970, Sept. 21. D. M. SUTHERLAND, JR. **Imitation wood is made of** compressed fiber impregnated with H_3BO_3 and red gum (from *Eucalyptus rostrata*). The fiber may be obtained from straw, paper, wood pulp, etc.

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U. S., 1,155,442, Oct. 5. J. Roehn. **A plastic material for tarring roads, etc.,** is made by freeing coal tar from phenols and phenol oils, and from $C_{10}H_8$ and naphthalene oils, mixing the residue of the tar with anthracene and anthracene oils and passing a current of air through the mixt. to thicken it and render it viscous.

U. S., 1,155,708, Oct. 5. J. A. DeCew. **An arsenical wood-preservative** is prepared by adding an alk. soln. of an As compd., *e. g.*, Na arsenite, to waste sulfite liquor and then slightly acidifying the product, which contains As compds. of colloidal constituents of the waste sulfite liquor.

U. S., 1,156,018, Oct. 5. S. B. Newberry. **A basic refractory lining for lime- or cement-kilns, etc.,** is formed of portland cement clinker mixed with about 10–20% of $CaCl_2$ which causes the clinker to form a firmly coherent lining even after heating to widely different temps. in different portions of the lining. Other halides of alk. earth metals have an effect similar to that of $CaCl_2$.

U. S., 1,156,122, Oct. 12. J. C. Woodley. **A bituminous composition for roofing, etc.,** is made by mixing fibrous material, *e. g.*, waste paper 20%, with hot residuum oil and asphalt or similar material, 80%, allowing the mixt. to stiffen somewhat and then pulling or otherwise mechanically treating it to disintegrate the fibrous material and distribute it uniformly throughout the binder.

U. S., 1,157,284, Oct. 19. M. H. Avram. **Apparatus for hydrating lime in a rotating drum** having a jacket into which steam generated during hydration is discharged to maintain a high temp. of the drum.

U. S., 1,158,371–2, Oct. 26. A. Carnie. **Calcining and clinkering cement.** Cement-forming materials are forced from a hopper into the upper part of the stack (having a lining of fire-brick) upon rotating blades which diffuse the finely divided material in the coal-dust flame from the burner below, which calcines and clinkers the mixt. without forming it into large aggregates.

U. S., 1,158,404, Oct. 26. J. W. Illingworth. **Preserving wood.** Low grade wood whose sap contains gums and acids is freed from bark while green and immersed in a bath of lime slush until satd. as completely as possible with lime.

U. S., 1,158,418, Oct. 26. T. M. Hart. **Bituminous road-surfacing material** is mixed with alum or other cryst. salt to convert H_2O of emulsification from the asphalt, etc., into H_2O of crystn. and thus improve the H_2O-repelling properties of the bituminous material.

Brit., 11,154, May 6, 1914. H. Parkinson. **Mfg. tar macadam** by heating granite or basalt to 400–500° F., which is sufficient to dry the tar used to cover the stones with a thin primary coat, the tarred stone being then cooled and subsequently mixed with a thicker tar, which constitutes the bond between the stones when laid on the road.

Brit., 13,448, June 2, 1914. H. E. Brown. **A hydraulic cement** is made by melting together calcareous, silicious, and aluminous materials, preferably under non-reducing conditions, and treating the molten mass with a soln. of a salt of an alkali, alk. earth, or Fe or other salt capable of increasing the hydraulic properties, and producing a finely divided hydraulic cement containing approx. 50% of CaO. If alkaliferous silicious material, such as feldspar, be employed, the alkali is volatilized during the furnacing operation and may be collected, and if desired, it may be collected in the form of halogen salt by adding a sufficient quantity of $CaCl_2$ or other halogen salt to the furnace charge. The fused mass may be treated with the alkali or other salt by running it upon a rotary drum so that it is distributed in finely divided particles in a chamber filled with a spray of, *e. g.*, a 5% soln. of $MgSO_4$. Plaster or gypsum may be added

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to the product to control setting. The calcareous material added to the charge may be in the form of carbonate, sulfate, or other Ca compd. Cf. *C. A.* 9, 704.

Brit., 13,478, June 2, 1914. MASTER BUILDERS CO. A **cementitious material** is made by mixing cement, H_2O and finely disintegrated Fe particles, each particle of which is covered with a thin film of Fe_3O_4. The Fe particles may be obtained by crushing or sifting cast-Fe borings, fillings, or turnings, and then roasting them in air for 5–15 mins. at 700–900°. The proportions of fresh alk. cement and Fe particles may be equal. The cementitious material may be used for bonding new cement to existing cement or concrete structures, and for hardening the surface of concrete structures.

Brit., 13,542, June 3, 1914. J. F. GODDARD. In mfg. **portland cement**, the clinker is mixed with gypsum or other suitable form of $CaSO_4$ previously treated or incorporated with tannic acid or tannin, and the mixt. is ground. Cement thus made is stated to be waterproof. Suitable proportions are 1 part by wt. of tannic acid or tannin to 5 parts of gypsum, and 0.8 part of treated gypsum to 100 parts of clinker.

Brit., 14,014, June 10, 1914. O. N. RIKOF. Constructional details of an app. for **washing sand.**

Brit., 14,690, June 18, 1914. A. FINGER. **Fireproof wall plates** or slabs composed of gypsum and peat refuse are strengthened by a wooden framework consisting of longitudinal box-shaped bars, the cross-bars being connected by cords.

Brit., 14,865, June 20, 1914. B. HANNEN. A **white hydraulic cement** is made by burning mixts. of argillaceous and calcareous materials containing a small proportion of Fe compds. in the presence of a chloride of an alkali or alk.-earth metal and at a temp. below that at which the mixt. clinkers but sufficiently high to produce a caked mass which requires reduction to powder form. The proportion of chloride used is, *e. g.*, 1 to 4% of the raw mixt. and a temp. between 1000° and 1250° may be employed.

Ger., 281,332 and 281,876, Nov. 6, 1912, Sept. 11, 1913. Addition to 281,331 (*C. A.* 9, 1988). FARBW. v. M. L. & B. Mfg. stable prepns., especially for the purpose of **preserving wood.** Cf. Fr., 463,288 (*C. A.* 8, 2786).

Ger., 282,359, Mar. 20, 1914. Addition to 281,793 (*C. A.* 9, 2303). M. RÜPING. **Process of perforating the surface of wood preparatory to impregnation.**

21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

The composition of coal. DAVID T. JONES AND RICHARD V. WHEELER. *J. Chem. Soc.* 107, 1318–24(1915); cf. *C. A.* 8, 865; 9, 241.—Powdered coal was extd. with dry pyridine in a Soxhlet and the residue (*a*) dried in a vacuum. The soln. was concd. poured into H_2O and the brown ppt. obtained extd. with $CHCl_3$. The insol. residue was designated (*b*). The $CHCl_3$ soln. was evapd., yielding a brown powder (*c*). Fractions *a* and *b*, considered by the authors to consist chiefly of humic compds., yield small amts. of liquid substances only, mainly phenols, while *c*, the resinous fraction, yields below 400° no phenols but 40–50% of paraffins, olefins and naphthenes. The latter material softens at 90°, melts at 102° and evolves gases at 170°. An oil distills up to 255°, having the compn. C 86.5, H 9.88%. The gases obtained in the distn. of *a* and *b* are similar, each containing about 60% paraffins, 15% H_2 and 13% CO. The theory that phenols exist in coal in the bound condition is untenable since coal is little affected by alkalies. Furthermore, such a substance as hexahydrophenol on decompn. yields, not H_2 and phenol but H_2O and cyclohexene. H. L. OLIN.

New method of determining nitrogen in coal and coke. OSKAR SIMMERSBACH AND FRIEDRICH SOMMER. *Stahl u. Eisen* 35, 601–5(1915).—One g. of coal or coke is

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mixed intimately with 26–7 g. CuO and burned in an atm. of CO_2. The N is collected over KOH soln. To remove CO, the gas is shaken in a pipet with ammoniacal Cu_2Cl_2 soln. and the vol. is measured after washing with dil. H_2SO_4. Two or 3 cc. of O are added to convert traces of NO to N_2O_4 and the latter is removed, together with the excess of O, by ammoniacal Cu_2Cl_2 soln. and the vol. of the gas is again measured. The mean of the two vols. represents the total N. Values obtained by this method are about 55% higher for coal and 27% higher for coke than those obtained by modified Kjeldahl methods. Probably most values for N in coal or coke hitherto published are considerably below the truth. W. T. HALL.

The significance of peat in industry. E. C. VERSCHOOR. *Chem. Weekblad* 11, 980–90(1914); cf. *C. A.* 7, 1798.—There is little prospect of any increase in the use of peat as a domestic fuel in cities because of its bulkiness and the increasing use of gas. At present its chief use (in Holland) is on flat grates under boilers—the most inefficient method. A large central station using step grates reports 3 kg. peat per kw.-hr. A plant using peat powder uses only 1.7 kg., but the cost of drying and grinding is nearly prohibitive. For small plants the suction producer is the most promising and several makes (German and English) gasify peat with complete success. A 50 h. p. plant reports 3.0 to 1.9 kg. peat of 44% H_2O per kw.-hr. as the load varied from 40 to 100%. A 300 h. p. plant reports 1.24 kg. peat of 25% H_2O per kw.-hr. It is calcd. that the fuel for 1 kw.-hr. costs *f* 0.004 (*f* = $0.40) for peat in a suction producer, *f* 0.007 for peat on step grates, *f* 0.007 for anthracite in a suction producer, *f* 0.01 for steam coal, and *f* 0.012 for a Diesel engine. W. L. BADGER.

Industrial uses of peat. E. C. VERSCHOOR. *Chem. Weekblad* 11, 1042–57(1914).—In using peat in a pressure producer, the opportunity of using the Mond process and recovering up to 70% of the N in the peat as $(NH_4)_2SO_4$ is a great advantage. The use of the pressure producer necessitates a larger plant than the suction producer (cf. preceding abstr.), and unless the problems of furnishing a year's supply of fuel during the summer months, and providing storage space for it, are carefully considered, serious difficulties may be experienced. Large plants have been operated a short time with complete success only to be shut down because of irregular and insufficient peat supply. If such storage can be provided the result is an extremely uniform fuel of low H_2O content for the greater part of the year. Calcns. are made for a plant containing 2 1000 h. p. engines. It is assumed that from a ton (metric) of peat there can be obtained gas for 1000 h. p.-hrs., 35 kg. $(NH_4)_2SO_4$, and 30 kg. tar. On this basis the power should cost *f* 0.0045 per h. p.-hr. (*f* = $0.40). This does not include the fixed charges on any elec. equipment; with these included the cost becomes *f* 0.0083. By assuming a little more favorable conditions, though not more favorable than have been reported from existing plants, it is calc. that 1 h. p.-year could be generated for *f* 30. It is calcd. that one district in Holland which has been fairly well surveyed would operate such a plant 42 years. The use of gas from such a plant in Bone-Schnabel boilers instead of gas engines is calcd. as calling for a consumption of 2 kg. air-dry peat per h. p.-hr. where the same peat on step grates needs 3.3 kg. [These 2 papers contain little new beyond the calcns. but present an extensive summary and comparison of data which is widely scattered and not easily accessible.—ABSTR.] W. L. BADGER.

Improvements in firing construction for solid fuels. PRADEL. *Feuerungstechnik* 3, 236–40(1915); cf. *C. A.* 9, 1682.—A review of recent inventions covering stokers, ash scrapers for fire tubes of boilers, hoppers, suction for removal of combustion residues, ash cooling, chains and grates for chain grates, safety and regulation appliances and improvements for firing with fuels rich in gases. H. R. GUNDLACH.

The reduction of the sulfur dioxide content in flue gases. ED. DONATH. *Oesterr.*

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Chem. Ztg. 18, 103–4(1915).—The SO_2 content in the gases can be materially diminished by the addition of CaO to the coal. ARTHUR LEDERER.

A bibliography of the chemistry of gas manufacture. W. F. RITTMAN AND M. C. WHITAKER. *Bur. Mines Tech. Paper* 120, 27 pp.(1915).—The references are classified under 10 main headings with cross references where necessary. An author and subject index is included. E. H.

Thermoelectric flue gas tester. ANON. *Feuerungstechnik* 2, 100; *Wochschr. Zentralver. Rübenzuckerind* 53, 182(1915).—A stream of the gas at const. temp. and velocity is led through KOH, and the heat evolved by the absorption of the CO_2 is measured by a thermopile connected to either an indicating or recording instrument. Made by Keiser and Schmidt. W. L. BADGER.

Gas generators producing liquid slags. GWOSDZ. *Feuerungstechnik* 3, 221–3 (1915).—A review supplementing that of Voigt's (*C. A.* 9, 1990) of generators producing liquid slags. Sailler's generator is mentioned as one of the early types and is briefly described with the difficulties that were desired to be overcome. Methods of construction used in several generators to prevent the formation of slag in the air passages are given. H. R. GUNDLACH.

The numerical and graphic representation of the colors of solids. L. BLOCH. *J. Gasbel.* 58, 121–7, 137–8(1915).—A comparison is made of the intensity of red, green, and blue light reflected from the surface in question and then from a white standard surface. The ratios red/green and blue/green used for designating the colors of lights (*J. Gasbel.* 57, 241–8(1914)), cannot be used, as they do not distinguish between shades of the same color, and represent as different colors different intensities of the same color. By taking 3 coördinates in space at right angles, black being the origin, and percent of red, green, and blue the 3 axes, a cube is obtained within which are all possible colors. Maxwell's color triangle is the diagonal plane joining the red, green, and blue corners. The colorimeter used consists of a box containing a standard white plate, the color to be compared, and an eyepiece which gives the usual circular field, half of each. In the eyepiece is a revolving slide with the three test glasses and a plain opening (Jena filters F4512, F6389, and F3873). The light enters through a side tube at an angle of 45° to the surfaces, and may be daylight or any artificial light provided it is uniformly diffuse. Fifty candles are sufficient and may be supplied by incandescent lights in an Ulbricht's sphere. The standard is illuminated through a fixed aperture and the unknown by an aperture whose area is regulated until the field is uniform. By calibration with a standard white in place of the unknown, the 100 % point for each color is detd. and then results for unknowns are expressed in % of the standard. A place is provided for transparent solids or solns. in the path of the variable light. The white standard is best made by smoking a metal plate with burning Mg. This is uniform, mat, and reproducible. For textiles and other materials with oriented structure, the receptacle for the sample may be rotated and its color detd. in different directions. Since the results are detd. by comparison with a white surface, they are independent of the kind of light used. By comparing 2 standard whites, one illuminated by daylight and the other by the source in question; and then comparing a color with the standard under any illumination, a set of ratios may be obtained from which the apparent color of the sample in a given light may be detd. The app. is made by Frantz Schmidt and Hantzsch. W. L. BADGER.

The use of coke in gas producers. HENRY MARKGRAF. *Stahl u. Eisen* 35, 373–5(1915).—Producers operated at a plant in Lorraine, using only coke, furnished a gas which compared very favorably with producers using coal. In some cases 1/4 to 1/2 coal was mixed with the coke. The gas was used in the rolling mills. It burned with a long flame more transparent than the ordinary flame. CARLE R. HAYWARD.

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The use of coke in gas producers. ANON. *Stahl u. Eisen* 35, 507–8(1915).—When coke is used alone the gas has a lower calorific power than when coal is used, because of the lack of CH_4. Mixts. of half coal and half coke have given a satisfactory gas. The flame was more transparent than that of ordinary producer gas. The coke should be crushed to nut size to secure the best results. The crushing adds to the cost of the coke and local conditions of transportation, etc., together with this crushing cost enter into a comparison of the producer results. CARLE R. HAYWARD.

Briquets from coke breeze. BEHR. *Feuerungstechnik* 3, 262–3(1915); cf. *C. A.* 9, 2144.—Expts. conducted by B. showed that briquets could not be made by a cold method and that a brittle material must be used as a binder to increase the resistance of the briquet to weathering and pressure. Hard pitch was found to be a satisfactory binder. The pitch is ground to a fine powder, 7% added to the coke breeze and thoroughly mixed. The mixt. is heated to 350° by means of superheated steam with simultaneous introduction of part of the flue gases from the superheater. The soft mass is then conveyed to the press and the briquets formed. A brief description is given of the machinery used. H. R. GUNDLACH.

Theoretical and practical determination of coke-oven thermal balances. HUGO KRUEGER. *Stahl u. Eisen* 35, 477–83(1915).—The heat required to coke coal containing various quantities of H_2O was theoretically detd. in an elec. lab. furnace and the result was found to agree fairly well with the figure calcd. from data obtained from com. ovens. The greatest loss of heat was found to be the heat contained in the hot coke on discharging. Some means should be found for saving this. CARLE R. HAYWARD.

Heating coke-ovens from the top. OSKAR SIMMERSBACH. *Stahl u. Eisen* 35, 745–52(1915).—The expts. indicate satisfactory results with top heating. This will allow a lowering of the height of the ovens. CARLE R. HAYWARD.

Acid-resisting alloy for bomb calorimeters (PARR) 9. Refuse incineration (STECK) 14.

BATEY, J.: **Steam Boilers and Combustion.** London: Scott, Greenwood. 220 pp. $1.50.

Handbuch für den deutschen Braunkohlenbergbau. 2nd Ed. Halle: W. Knapp. 880 pp. $11.

HODGSON, J. T.: **Boiler Room Practice and Smoke Abatement.** London: "Railway Engineer." 321 pp. $1.

U. S., 1,154,858, Sept. 28. J. C. HECKMAN. **Filtering material for purifying gas** is prepd. from "granulated" blast-furnace slag mixed with hydrated Fe oxide.

U. S., 1,154,859, Sept. 28. J. C. HECKMAN. **A material for purifying gas** is made by passing coal-mine water through a mass of "granulated" blast-furnace slag. The Fe sulfate in the H_2O combines with the lime in the slag to cause deposition of hydrated Fe_2O_3 in the pores of the slag. The product may also be used as a pigment or fertilizer.

U. S., 1,155,385, Oct. 5. F. TSCHUDY. **Purifying distillation gas and making ammonium sulfate.** The gas is cooled to separate tarry constituents and aq. liquor and the weak ammonia liquor thus obtained is decanted. The gas is then cooled to 25–30° and the condensate and weak ammonia liquor are distd. The gas is compressed sufficiently to raise its temp. to 37° and is further heated to about 41° by passing through one compartment of a saturator in an adjacent compartment of which the distn. vapors

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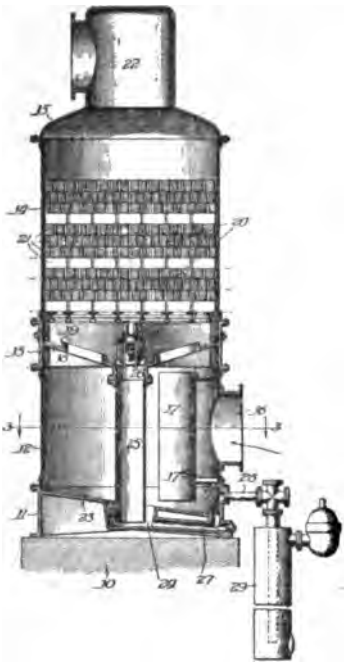
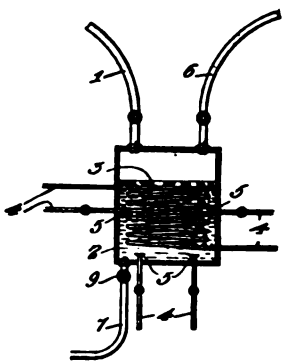


are caused to react with a spray of H_2SO_4. The gas is then passed to the distributing mains.

U. S., 1,155,386, Oct. 5. F. TSCHUDY. **Apparatus for recovering ammoniacal vapors from coal gas** by treatment with acid.

U. S., 1,155,387, Oct. 5. F. TSCHUDY. **Apparatus for extracting tar from coke-oven or similar distillation gas.** Gas entering at *16* strikes the baffle *17* which causes deposition of some of the tarry material. The baffle gives the gas a whirling motion in the chamber *12* and it passes up through openings in the diaphragm *18* and through checkerwork *20*. Tar collecting on the checkerwork gradually forms drops which fall onto the diaphragm *18* and thence are led to the collecting pan *24*, overflow pipe *28* and tar-seal *29*.

U. S., 1,155,419, Oct. 5. H. HENNEBUTTE. **Making pure carbon for electrical purposes, etc.** Coal tar, petroleum tar or tar oil is freed from fine suspended solid material by filtration or settling and is then supplied through a pipe *1* to a still *2* where it is heated by a steam coil *3*. Air from pipes *4* is forced into the material through nozzles *5* to dehydrogenate the oil and produce a product which on further carbonization will yield pure, graphite-like C. After being partially carbonized at 400–500° a solvent from the pipe *6* dissolves the sol. matter which is led through *7* to a still and the insol. matter in the chamber *2* is further heated to complete the carbonization.



U. S., 1,155,443, Oct. 5. J. ROSEN. **A material for electrical insulating and waterproofing** is prepared by heating coal tar to free it from caustic and easily crystallizable substances such as phenols and $C_{10}H_8$, adding heavy neutral tar oil to the residue while hot and then satg. paper, felt or other absorbent material with the product and treating the material with a current of cool air to oxidize and solidify the impregnating material.

U. S., 1,155,753, Oct. 5. J. MACKENZIE. **Making ammonium sulfate from coal gas.** The gas is treated in a moist atm. with HNO_3 or N oxides at a temp. of about 95°, after removal of tar, to oxidize the S compds. in the gas and form $(NH_4)_2SO_4$. Any excess of nitrous compds. remaining is absorbed is H_2SO_4 and recovered for further use by denitration.

U. S., 1,156,022, Oct. 5. M. P. P. RIIS. **Purifying wood- or coal-gas.** The gas is first allowed to bubble up through H_2O and is then passed successively through charcoal, sawdust and $Ca(OH)_2$ in another chamber and into a 3rd chamber where it is successively treated with charcoal, sawdust and $Ca(OH)_2$, horse manure, rusted Fe chips, mixed sawdust and $Ca(OH)_2$, a layer of burlap and a mixt. of sulfates of Zn, Fe and Cu and finally treated with anhydrous $CuSO_4$.

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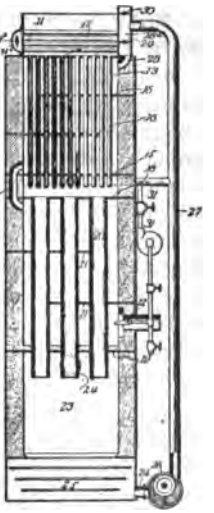
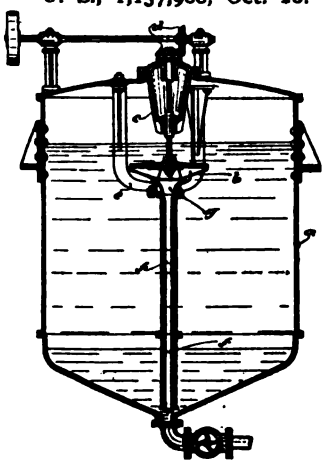
U. S., 1,157,089, Oct. 19. S. M. DARLING. **Making gas from lignite.** Lignite from the hopper *11* descends by gravity past angle-bars *12* into the tubes *13* depending from the flue-sheet *14*. Fuel in the lower section of the app. is ignited at the point *22* and combustion products pass upward through the by-pass *17* around the tubes *13* from which the lignite finally descends into the lower tubes *20* where it is destructively distd. and treated with CO_2 and steam. The resulting gas is drawn off through the outlet *24*. Steam and gas driven off from the lignite in the upper tubes are passed to the lower portion of the app. to increase the amt. of gas.



U. S., 1,157,988, Oct. 26. H. KOPPERS. **Apparatus for purifying benzene by treatment with sulfuric acid.** The centrifugal wheel *b* sucks acid up through the pipe *f* and mixes it with the C_6H_6 in the upper part of the app.; when not in operation only the pipe *f* and bottom of the tank are in contact with the acid.



Brit., 10,780, May 1, 1914. L. C. BONNEAU and V. E. HASENFRATZ. Construction and operation of a plant for **treating gas-purifier waste** with C_2HCl_3. When the material is completely extd., the soln. is directed to a reservoir. H_2O from a pipe is then admitted to the extn. chamber and the mixt. is transferred to a mixer provided with a stirrer and a source of heat, and attached to a condenser for recovering the remaining solvent. $Ca(OH)_2$ is then added, and after heating to boiling, the mixt. is transferred to a column still. The NH_3, after passing through a second column, is absorbed in a saturator, connected with acid and liquor tanks, and the vapors not condensed are passed to the furnace and burned. The $(NH_4)_2SO_4$ is discharged to a centrifugal drier. The insol. matter from the still is washed; the washings are returned to the extn. chamber and may be re-oxidized and used again. The soln. is passed into settling vats, KCl is added, to ppt. $CaK_2Fe(CN)_6$, which is treated in the 2nd vat with Na_2CO_3 to obtain sol. $K_2Na_2Fe(CN)_6$. This is acidified with H_2SO_4 and treated with $FeSO_4$, the white ppt. being oxidized by NaOCl or H_2O_2, to obtain Prussian blue.

U. S., 1,158,367, Oct. 26. G. BLIEBERGER. **A fuel for internal combustion engines** is produced by mixing MeOH 100, acetone 5, $PbCO_3$ 5 and sylvic acid 15 parts, distilling the mixt. and collecting the distillate up to 110°, adding it to petroleum distillate obtained between 150 and 300° and gasoline and sepg. the liquid product from the sediment which deposits on standing.

Brit., 14,973, June 23, 1913. I. MORR. In **mfg. incandescent gas mantles,** the mantles are strengthened by applying to the finished but unvarnished mantle a suspension of refined, white China clay in H_2O, containing about 100 parts by wt. of China clay in 7,500–8,000 parts of H_2O. $K_2Mn_2O_8$, 1 part, may be added to prevent brittleness. The liquid may be applied to the mantle by spraying; the mantle is then heated to incandescence, and may afterwards be varnished.

Brit., 11,136, May 6, 1914. W. CLIMIE. App. for **purifying gas.**

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Brit., 11,178, May 6, 1914. H. J. Toogood. **A charge support for vertical gas-retorts.**

Brit., 11,236, May 6, 1914. F. Haber and R. Leiser. In app. for **testing gases** consisting of 2 closed organ pipes, 1 at least of which is a membrane pipe, blown by the same gas current, alterations in pitch in the 2 pipes due to variations in pressure in the blowing current are avoided by providing a pressure regulator in the gas passage, and making the pipes long and blowing to an overtone. In addition, the strength of the blast on the 2 pipes may be equalized by providing throttling devices in 1 or both of the branch passages leading to the pipes, or by making the blowing slits of the pipes adjustable.

Brit., 11,246, May 6, 1914. H. F. Smith. **Removing tar particles** or other impurities **from gas** by passing the gas through a pervious medium at sufficient velocity to cause the particles to become attracted by and pptd. on the medium by the static elec. which is generated by the friction of the gas passing through the medium.

Brit., 11,345, May 8, 1914. E. Eaton. Mfg. **composition fuel** by introducing steam, laden with petroleum or other oily vapor, into a mixt. comprizing 88 parts of chalk, 12 of solidified tar, and from 2 to 5 of oil, such as petroleum or naphtha oil from tar. The steam may be led through a tank of oil, which may be heated.

Brit., 11,562, May 11, 1914. A. Fingerland, A. Indra and A. Lissner. A **coke** poor in S. See Ger., 270,573 (*C. A.* 8, 2243).

Brit., 12,400, May 20, 1914. T. R. Wollaston. In **gas-producers** of the kind having a grate, nozzle, or blast-distributing device serving to support the fuel, means are provided for superheating the blast and stirring the fuel consisting of a blast-heating pipe arranged at or near the center of the producer and extending from a fixed or rotating grate, or depending from a rotary or oscillating crown. The blast-pipe may be cylindrical, elliptical, triangular, or of other shape in cross-section, and is provided with an internal pipe delivering the blast to its upper closed end, from which it passes downward to the grate, etc. Cf. *C. A.* 9, 1544.

Brit., 13,930, June 9, 1914. Soc. d'Exploitation des Appareils Rateau. Constructional details of a **centrifugal fan for separating dust, tar,** etc., **from gases.**

Brit., 14,013, June 10, 1914. E. Eaton. **Composition fuel consists of 40 parts** of chalk, 40 of carbonaceous material such as small coal, coke, cinders, ashes, or clinker, 12 of clay, and 8 of solidified tar, the whole being pugged with admitted steam, which may bear oily vapors, and pressed. The ash is suitable for mfg. cement. Cf. *C. A.* 8, 3233.

Brit., 14,243, June 13, 1914. C. Still. In order to equalize the suction exerted by the exhauster on the various **coke ovens** of a battery, the gas is drawn off from a collecting-main through a subsidiary main extending parallel to the collecting-main, and connected thereto by a series of openings, which increase in cross-sectional area with the distance from a pipe leading from the main to the exhauster.

Brit., 14,458, June 16, 1914. J. W. Hughes. In **furnace operations,** raw and finished articles are simultaneously fed on to and removed from a traveling hearth by endless conveyors extending transversely across the surface of the hearth.

Brit., 14,618, June 18, 1914. J. S. Bean and H. Nash. In a process of **utilizing waste from locomotives,** smoke-box refuse from locomotives is fed to a gas-producer and the gas produced is utilized for raising steam in locomotives prior to going on service or for heating feed-water or other heating purposes connected with steam locomotives. The blow-down water from locomotives is led through a tank where it communi-

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cates heat to tubular feed-water heating app., and is finally led to settling and storage tanks, from which it may be drawn and heated for use as feed H_2O or for washing out boilers.

Brit., 13,934, Jan. 5, 1915. A. M. DUCKHAM. **In carbonizing retorts,** through which the fuel is conveyed in the direction of increasing temp., collecting chambers are arranged alongside each retort to sep. the distn. products from zones of different temp. Steam may be introduced into the hottest zone to increase the production of NH_3. The retorts are built of steel plates and channel irons, and the collecting chambers are formed by channel irons and are subdivided by transverse partitions. Each compartment is fitted with an outlet pipe so as to form a common passage for gases and liquids to collecting mains, resp. The outlets from the retorts are made by bending outwards angular pieces cut in the sides. Gas burners are placed in the flues near the discharge ends of the retorts, and air-supply openings are formed by cutting away a part of the channel iron at the side of the flue.

Ger., 282,591, June 30, 1912. DR. MIECZYSLAW VON WIERUSZ-KOWALSKI. **In mfg. fodder briquets from hay, straw, and other fodder,** beets or other saccharíferous plants, in comminuted form, are subjected after warming with H_2O to the action of alkalies, such as soda, the resulting gelatinous mass, after cooling, is neutralized with HCl or other acid, the product is added to the hay, straw, or the like, as a binder, and the mixt. is briquetted in the usual manner. The amt. of added alkali, its period of action, and the temp. depend upon the kind and quality of the beets used. If the beets are withered or woody the amt. of alkali must be greater and the temp. higher. According to the quality of the beets the temp. varies between 70 and 95°, and the amt. of alkali between 2 and 8%. It is applied in the form of a 25% soln. By heating with alkalies a sterilization of the mass is also effected. A low pressure is sufficient in making the briquets, since the firmness of the latter is secured by the binder.

Ger., 283,434, July 8, 1910. J. FEYÉR. **Method for firing with bituminous fuel** whereby the fire box is surrounded by a mantle for the introduction of air for combustion.

Ger., 283,534, Jan. 21, 1911. GES. FÜR INDUSTRIELLEN OFENBAU POPPE & CO. **Pressure carbonization of moist slime and peat.** The dredged or cut material is spread out upon drying surfaces, and after a certain amt. of H_2O has been lost, dependent upon the weather, it is brought together in low heaps, and then shovelled, the wet with the dry, into heaps of about 8 m. in height. Heating in these heaps to 82° results spontaneously, and the height is reduced one-half. Even in the years with most frequent rains the H_2O content is reduced to below 40%, and the pressure exerted by the heap effects a degree of carbonization. The product has the consistence of briquet material, is a good fuel, and may be transported readily.

Ger., 283,772, Sept. 16, 1913. H. JUNKERS. **Heat exchanging device** for high pressure steam, wherein the steam imparts its heat to the walls of a group of tubes.

Ger., 283,561, Feb. 24, 1914. PETRY-DERBUX, G. M. B. H. **Device for regulating the temperature of superheated steam,** with the use of a surface cooler traversed by feed H_2O.

Ger., 283,809, Apr. 17, 1914. C. KLEVER. **Heating elements for utilizing waste heat from heating furnaces.**

Ger., 283,924, May 8, 1914. Addition to 237,095 (*C. A.* 6, 1982). H. KOPPERS. **Preheating air for large chamber furnaces** for the production of gas and coke.

Ger., 283,995, June 7, 1913. CHEM. FABRIKEN DR. K. ALBERT and DR. L. BERREND. **A fuel** is prepd. from mineral and like oils with the use of an emulsion of the oils and sulfite cellulose back water as a binder. If desired, wood, peat, coal, leather, and other combustible materials may be incorporated with these emulsions. The thick,

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tenacious mass obtained from mineral oils and the like and sulfite cellulose back water burns rapidly after being kindled, leaving a white ash and producing very little soot. The fuel product is not explosive, and will not be kindled merely by sparks or incandescent bodies. The ignited mass can be readily extinguished at any time, and can be fired in any form of furnace.

Ger., 284,359, Sept. 20, 1913. E. FLEISCHER. **Mfg. fuel gas, with the withdrawal of the product from the combustion zone without its contact with cooler fuel.**

Ger., 284,402, Feb. 3, 1914. C. DINSE. **In mfg. a fuel from ashes and mineral oils or their residues, a sludge of ash, petroleum, and finely divided sawdust is mixed with sufficient boiling paraffin to form a mass which solidifies on cooling.** *E. g.*, 255 g. fine wood or coal ash are mixed with 100 g. petroleum to a thin slurry free from lumps. Finely divided sawdust 20 g. is added and the mixt. stirred with 125 g. boiling paraffin. As soon as the thoroughly worked mass is stiff it is compressed into sheets. The product is said to be readily ignitable.

22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

The range of applicability of the liquid sulfur dioxide method for determination of aromatic constituents in hydrocarbon mixtures. W. F. RITTMAN AND R. J. MOORE. *Met. Chem. Eng.* 13, 713–4(1915).—The authors conclude from expts. on known mixts. that the Edleanu method works well for the estn. of small quantities of aromatic hydrocarbons, but is not applicable where the amt. exceeds 25%. Conc. mixts. can be dild. with pure water-white Pen. kerosene. Temp. at which extns. are performed must be low, preferably about —20°. F. M. ROGERS.

Discrimination of benzine and benzene. (A test for benzene in benzine.) H. MIX. Helfenberg. *Kolloid Z.* 17, 7–9(1915).—The dragon wood of Sumatra contains a red resin that if, first washed with hot petroleum, heavy benzine, light benzine and then cold benzine, is colorless but with even traces of benzene gives a red color. This resin is called "dracorubin" and may be dissolved in benzene and taken up with filter paper making a dark red, gummy test paper which will distinguish between benzine and benzene, detect traces of benzene in benzine and give a criterion for the degree of refinement of benzine, which is the greater the less color the benzine gives with this paper. A table shows the effect of 30 org. liquids classifying both the color of the liquid after treatment with the test paper and the color of the test paper after the tested liquid has evapd. The color effects with benzene are characteristic and indicate even small amounts of benzene but would not furnish a quant. colorimetric method for benzene.

H. I. MATTILL.

Industrial oil firing installations. R. SCHMITT. *Feuerungstechnik* 3, 257–61, 272–6(1915).—The methods of oil firing are differentiated according to whether the oil is fired in its original condition, atomized or in the gasified state. S. describes a number of types of construction that may be used for one of the above methods of firing oil. Detailed drawings and descriptions of furnaces of various types used in the metallurgical, chemical, and ceramic industries are given. A comparison of costs of firing with a good quality of bituminous coal and oil is made and S. concludes that oil firing is advantageous even when the cost of the oil is twice that of the coal. H. R. GUNDLACH.

Atomizing burners for oil-firing. ESSICH. *Feuerungstechnik* 3, 245–7(1915).—E. describes the advantages of firing oil by means of atomizing nozzles, and discredits the adherents of the oil gasification firing, who claim that atomized oil is incompletely burned with resulting sepn. of C. One of first conditions of oil firing is that none of

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the unvaporized oil shall come into contact with the furnace walls. The atomized oil from the nozzle is gasified by the heat radiated from the burning oil, and in a properly adjusted nozzle the air and oil mixt. should be completely vaporized at a very short distance from the nozzle. Nozzles used for atomizing oil by means of air under pressure and those used for atomizing preheated oil under its own pressure are briefly described with illustrations. H. R. GUNDLACH.

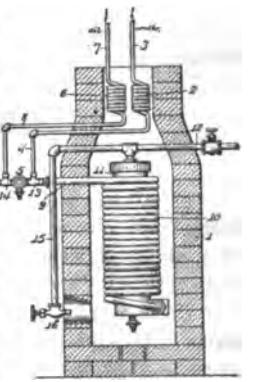
Turbine lubricants (OTTO) 27. Chemical control in the manufacture of machine greases (DAVIDSOHN) 27.

BARTH, M.: **Ueber den Dieselmotor, seine Erprobung und seine Treibmittel.** 4th Ed. Kiel: Lipsius & Tischer. 32 pp.

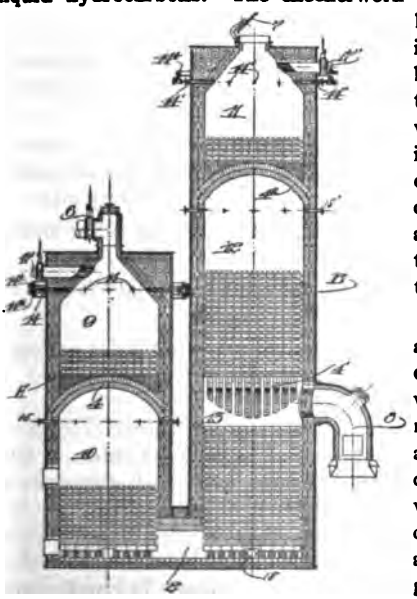
STREETER, R. L.: **Internal-Combustion Engines.** New York: McGraw-Hill Book Co. 418 pp. $4.

WIMPERIS, H. E.: **Internal-Combustion Engine.** 2nd Ed. London: Constable & Co. 336 pp. $1.50. Revized Ed. 319 pp. $3.

U. S., 1,154,869, Sept. 28. C. D. MCHENRY. **Apparatus for making fuel gas from oil.** H_2O and crude petroleum or asphalt oil supplied through the pipes *3* and *7*, resp., are emulsified together in the mixing device *5* after passing through the heating coils *2* and *6*. The emulsion is passed through the heating coil *10* in the furnace *1* and the gases produced after passing through the expansion tank *11* are delivered through the pipe *12*. A portion of the gas supplies the burner *16* to heat the retort coils.



U. S., 1,157,225, Oct. 19. E. C. JONES and L. B. JONES. **Making illuminating gas from crude petroleum oil or other liquid hydrocarbons.** The checkerwork of the app. is first heated to gas-making temp. by combustion of oil supplied through the pipe *14* at the top of the short generator *A* together with air admitted at *6*, while the gas-outlet *8* is closed by a hydraulic seal. Oil is then distd. in chambers *10* and *12* and on the checkerwork, being supplied through pipes *15* and *15'*. H, CO and steam may be supplied through the pipes *17*, *17'*, *14* and *14'* during this operation.



U. S., 1,157,316, Oct. 19. B. R. LYSTER and M. J. LYSTER. **Destructive distillation of wood** is effected in a series of retorts which are fired successively so that different retorts are at different stages of the process at any time, and uncondensable bases from certain retorts are introduced into others which are at a more (or less) advanced stage of the run to increase the yield of MeOH and HOAc by complementary actions of the gases.

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U. S., 1,158,205, Oct. 26. T. T. GRAY. **Deblooming petroleum distillates or other hydrocarbons and converting them into fatty acids and esters** is effected by treating them, while heated, with ultra-violet light, an oxidizing agent, *e. g.*, air or O, and a catalyzer.

Brit., 11,420, May 8, 1914. P. PORGES, S. STRANSKY and H. STRACHE. **In cracking petroleum and other heavy hydrocarbons** to produce light hydrocarbons by passing the oil vapors mixed with steam over a heated catalyst, the catalyst is regenerated when the production of light hydrocarbon begins to decrease by passing air or O over it. The catalyst is an oxide of a metal, *e. g.*, oxide of Fe, Pb, Ce, Mn, or other metal having several stages of oxidation. The app. comprizes a still to which steam is admitted by a pipe, cracking retorts heated to 500–600° and fitted with pipes for the supply of air and the discharge of the products of the regenerating process, a dephlegmator whence the heavier constituents of the cracked oil are returned by a pipe to the still, a purifier containing PbO and an alkali or an alk. earth, and condensers maintained at temps. of 15° and —10°, resp. The uncondensable gases are used for heating purposes, or compressed into reservoirs for future use.

Brit., 13,770, June 6, 1914. C. E. JOHNSON. **Combined mixed gas and steam** is produced by the combustion of liquid or gaseous hydrocarbons in contact with finely divided H_2O.

23. CELLULOSE AND PAPER.

A. D. LITTLE.

U. S., 1,154,851, Sept. 28. E. P. FOLEY. **Bleaching wood pulp.** The pulp is formed into a thin sheet from which surplus H_2O is pressed out. Then the sheet is led on a felt apron between rolls and a thin film of conc. bleaching soln. is applied to the pulp as it is wound on one of the rolls and pressed.

U. S., 1,155,256, Sept. 28. C. MARCHAND. **Obtaining alcohol from waste sulfite liquor.** H_2SO_4 is added to the liquor to liberate and expel SO_2 and the liquor is evapd. *in vacuo*, leaving only small amts. of SO_2 and H_2SO_4. The remaining SO_2 is oxidized to H_2SO_4 by treatment with $KMnO_4$, H_2O_2, O_3 or other oxidizing agent, and the acids neutralized with lime and after settling and decantation, the decanted liquor is fermented and distd. to obtain alc.

U. S., 1,155,741, Oct. 5. T. LEE. **Paper-making fiber from bagasse** is prepared by partially drying the moist bagasse and mechanically separating the hardest and softest fibers from the intermediate grade, washing the latter and digesting in NaOH soln.

U. S., 1,156,800, Oct. 12. G. E. MILLER. **Apparatus for reclaiming sulfur dioxide** from vent gases of paper pulp digesters.

U. S., 1,156,969, Oct. 19. W. A. BEATTY. **Threads for weaving into fabrics** are formed of cellulose acetate and dihydroxydiphenyldimethylmethane.

U. S., 1,158,400, Oct. 26. W. P. COHOE. **Thin walled tubes for casing sausages** are formed of cellulose hydrate waterproofed with gelatin treated with alum, CH_2O or tannin.

Brit., 13,696, June 5, 1914. SOC. CHIMIQUE DES USINES DU RHONE (ANCIENNEMENT GILLIARD, P. MONNET, ET CARTIER). In the manuf. of **cellulose esters of fatty acids**, the cellulose is subjected to a preliminary treatment with small quantities of Ac_2O in the presence of a catalyzer dild. with glacial HOAc. *E. g.*, cellulose is warmed with a mixt. of glacial HOAc, H_2SO_4, and about $^1/_6$ of the Ac_2O required for acetylation. After a suitable time, the remainder of the anhydride is added, and the acetylation conducted as usual. The acetate obtained is characterized by insoly. in nitrobenzene,

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acetone, or ether, slight soly. in alc., and ready soly. in $CHCl_3$. The acetates may be partly saponified in soln., giving acetates sol. in acetone, plastic in $CHCl_3$, EtOAc, and $C_2H_2Cl_4$.

Brit., 14,042, June 10, 1914. BADISCHE. **Cellulose acetate solutions,** suitable for lacquering and for the production of artificial silk or of films, are prepd. by dissolving acetone-sol. acetylcellulose in a fully hydrogenized monocyclic ketone, particularly cyclohexanone or methyl cyclohexanone, with or without another solvent or diluent, such as alc., acetone, EtOAc, or benzene.

Brit., 14,070, June 11, 1914. S. MILNE. In a process of **refining** the insufficiently **digested** portions of **esparto** and like **pulp,** to bring them into a condition most suitable for bleaching and to render subsequent straining unnecessary, the pulp, which may be prepd. either by digesting in app. of the kind described in 12,881, 1914, and washing in app. of the kind described in 6,948, 1914, or in the ordinary way, and reduced to pulp in a hollander or kneader, is delivered from a chest to a sand table, a strainer which removes roots and other unusable matter, a fine strainer, and concentrators to a tank. The portion rejected by the fine strainer passes through a concentrator to a refining engine which seps. the fiber bundles, and returns the pulp to the chest from which it is passed again with fresh pulp to the sand table. The strainer may be dispensed with, the unusable matter being removed from the rejections of the strainer by an auxiliary strainer. The refiner may be placed so that the whole of the material is treated after it passes the first strainer, and before it passes the fine strainer, the rejections from both strainers being treated by the auxiliary strainer which removes the unusable matter and allows the usable pulp to return to the chest, where it mixes with fresh pulp.

Brit., 14,111, June 11, 1914. A. H. KILNER and FOOD FLAVOR PRESERVATION PROCESS. **Bags** or receptacles of paper or fabric for **enclosing** articles of food for **cold storage** are impregnated with viscose or other cellulose soln. to render them practically impervious to air.

Brit., 14,216, June 12, 1914. E. BERL and M. ISLER. In the manuf. of **artificial silk, horsehair,** etc., **and films** from solns. of nitrocellulose, the squirting soln. consists of a collodion prepd. from a nitrocellulose containing 20–30% of H_2O, and the coagulating-bath contains 25–50 vol. % of alc. while it is maintained at a temp. not above the b. p. of ether, *e. g.*, 35.5°. The collodion may be prepd. with a mixt. of alc. and ether, in which the former predominates. Cf. *C. A.* 8, 825.

Brit., 14,339, June 15, 1914. L. LILIENFELD. **Solutions of polymerized cellulose xanthates** are prepd. by heating raw viscose until the xanthogenate ppts., washing with H_2O the ppt., and redissolving in alkali. It is preferred to use viscose containing not more than 5% of cellulose, and to effect the pptn. at 60–80°. A viscose very suitable for the process is prepd. according to the process of 1,378, 1912 (*C. A.* 7, 2307). The solns. so obtained are free from color and very permanent, give threads and films which are transparent and very strong, and may also be used in the prepn. of plastic masses, dressings and loadings for fabrics, paints and coatings, and sizes for paper, and in printing on textiles.

Brit., 14,421, June 16, 1914. J. L. JARDINE and T. A. NELSON. App. for **preparing bamboo and kindred material for the manufacture of pulp.**

Ger., 283,210, Sept. 26, 1913. M. SCHMIDT. Mfg. a solid acid- and heat-resisting coating on **drying cylinders for parchment paper** whereby a soft, permanent, dust-free product is obtained. As a result of the drying of the parchment paper, prepd. by the action of a H_2SO_4 of 50–60° and subsequent treatment with a NaCl soln., using the usual Fe drying cylinders, the surface of the cylinder is strongly attacked and oxidized so that the parchment paper contains yellow flecks. In order to provide a coating on

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the cylinder which will prevent such oxidation, the surface is at first thoroughly cleaned and polished to remove dirt, rust and the like. The surface is then brushed over with a mixt. of benzine 1 and camphor oil 3. The first coating is then applied, consisting of a mixt. of 30 parts of the sap of *Rhus vernicifera*, 30 of lamp black, 20 of powdered Al, 10 of turpentine, and 10 of alc. After this coating is completely hardened by passing over it large amts. of moist air, it is coated with pure camphor spirit. A second coating of the same mixt. is then applied. After this also has hardened and has been coated with camphor spirit, the cylinder is ready for use. The coating adheres firmly to the cylinders so that it does not scale, and is also resistant to heat and acid.

Ger., 283,290, Sept. 17, 1913. Addition to 279,517 (*C. A.* 9, 1247). C. BRAUN. Mfg. a light colored and easily bleached **cellulose** from red beech wood by boiling the shredded wood in the boiler at a temp. rizing to 140°, with lyes of Ca, Mg, or alkali bisulfite, which, dependent upon the age and moisture content of the wood, contain between 40 and 60% of combined SO_2. The amt. of alkali present is sufficient to combine with the acid products of decompn. resulting from the boiling process. After expulsion of the lyes the residual lye is removed as quickly as possible with the most effective exclusion of atm. air possible. After the uniformly and carefully disintegrated wood is placed in the boiler, it is subjected to a preliminary steaming at a temp. not above 120°, then steam and H_2O of condensation are drawn off, and $Ca(HSO_3)_2$ lye, or the like, is introduced with the aid of the resulting vacuum, applying for 100 kg. wood, 18 kg. SO_2, of which 55% is combined with CaO. The temp. is then increased, during a period of 8 hrs., to 150°, and maintained there for 1 hr. With a residual content of 0.3–0.4% SO_2 the lye is blown out, then H_2O containing warm or reducing substances is introduced as a wash, or the product is discharged into such wash H_2O, taking care to effect a rapid removal of the lye. The red beech product obtained by this process with the aid of $Ca(HSO_3)_2$ lye can be bleached with about 12% $CaOCl_2$, while by employing Mg or alkali bisulfite lye a product is obtained which can be bleached with 8–9% $CaOCl_2$. Cf. *C. A.* 9, 1247.

Ger., 283,304, Dec. 28, 1913. R. ADLER. Mfg. sol. or dissolved **cellulose derivatives** by mixing the reaction mixt. obtained in the usual manner by heating cellulose with HNO_3, with hydroxides or carbonates of the alk. earths or heavy metals. The sol. nitrates are then extd. from the salt. mixt. by means of H_2O, and an acid whose alk.-earth or heavy metal salt is insol. in H_2O is added to the washed salt of the oxidized cellulose. The required amt. of an alkali or NH_4 salt soln. for the soln. of the oxidized cellulose is then added, the liquid is sepd. from the insol. alk.-earth or heavy metal salt, and evapd. to the desired concn. The end products can serve, in the form of their solns., for the production of articles of pure cellulose.

Ger., 283,577, Jan. 25, 1914. P. NEBRICH. App. for **recovering acid from cellulose gases**, and using them for strengthening the boiling lye.

24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

Modern munitions of war. VIVIAN B. LEWES. *Nature* 95, 605–9(1915).—A discourse. W. H. Ross.

Explosives. G. BUCHNER. *Z. Ver. deut. Ing.* 59, 469–72, 489–92, 511–4(1915). —B. reviews the growth and development of explosives from black powder to the most modern types, giving the advantages of the various explosives and the use for which they are best adapted. The methods for detonating the various explosives are described. H. R. GUNDLACH.

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Ammunition manufacture in Canadian and American plants. F. HEYN. *Stahl u. Eisen* 35, 545–9(1915).—The 32 operations required for producing a schrapnel shell are tabulated and a few briefly commented upon. The av. time for producing a schrapnel shell at the Dominion Bridge Co. plant is 1.06 hr. CARLE R. HAYWARD.

The precipitation of trinitrotoluene from concentrated acid solutions by means of water. W. MCHUTCHISON AND R. WRIGHT. *J. Soc. Chem. Ind.* 34, 781–2(1915).—The object of the investigation was to det. the minimum quantity of water necessary for the complete sepn. of the explosive from its mother liquor in order to avoid unnecessary expense in the recovery of the spent acids. Using specially prepared acid solns. and also acid residues from explosives works it was found that the max. pptn. of trinitrotoluene occurred on addition of the acid to 4–5 vols. of water. A greater diln. or the addition of the water to the acid proved less efficient. CHARLES E. MUNROE.

The trinitrotoluene industry in Italy and its conditions of development. M. GIUA. *Monitore tecnico;* through *Z. ges. Schiess-Sprengstoffw.* 10, 109–11(1915).—G. gives information on manuf. of trinitrotoluene (TNT) and discusses conditions of development in order to point out better ways of tar distn. Technically, toluene is nitrated in 2 phases: (1) nitration converts toluene either to mono- (a mixt. of *o*-, *m*- and *p*-) or (2) to dinitrotoluene (a mixt. of 1,2,6- and 1,2,4-). The second nitration converts mono- or dinitrotoluene to TNT. The most practical and widely adopted procedure is the conversion to the di-product, which is nitrated with refreshed acid mixt. to TNT. A high tax on alc. obtains in Italy and the product cannot be recrystd. economically; therefore dinitrotoluene (63–66°) is the starting point for nitration to TNT. Denatured alc. is not usable because pyridine gives a darkening afterwards. As carried out at Cengio (Savona) a product is obtained whose m. p. is only 1–1½° below that of the chem. pure compd. By washing repeatedly with H_2O and remelting several times a product m. 79.5–80.6° is obtained. G. states that low m. p. dinitrotoluene is used in Germany and the resultant TNT recrystd. from alc. Mono- and dinitrotoluene may be prepd. using an acid mixt. (HNO_3 and H_2SO_4) which contains on an av. 15–20% H_2O and 18–22% HNO_3. The nitrating mixt. must have an excess of HNO_3 (ordinarily 1.5–1.8 times the theoretical amt.); otherwise the resultant product is inferior. An oil is always formed; this is removed mechanically or by cooling. This oil was formerly regarded as worthless in Italy as it yielded low m. p. TNT; in Germany where TNT is recrystd. from alc. it is used as initial material. In comparison with dinitrotoluene this oil is a very cheap starting material. A table is given showing the influence of HNO_3 and H_2O. The results of the reaction are represented in a diagram as a function of temp. and time. Temp. must not rize above 110–20°. A too rapid rise is always dangerous. A table gives the compn. of mixed acid, the ratio between toluene and mixed acid and products obtained. HNO_3 varied between 15 and 30%, H_2SO_4 78 and 55% and H_2O 5 and 20%. The ratio of toluene to nitrating acid varied between 1:7 and 1:15. A powerful stirring app. is required for the manuf. of dinitrotoluene to prevent light toluene from settling above heavy nitrating acid, thus failing to react completely. The conversion of dinitrotoluene to TNT requires a perfectly anhydrous acid mixt. of H_2SO_4 and HNO_3 (18–25% in ratio of 1:4 or 1:5). The dinitro product begins to react between 60 and 65° and continues of itself. Rise in temp. must be regulated by energetic stirring or by cooling. Temp. ordinarily reaches 118–122°. A single nitration of the red or "Tropf" oil which consists of a mixt. of mono-, di-, and TNT did not give a utilizable TNT if the latter is not recrystd. from some solvent because from 5 to 7% of the oil remains unnitrated under ordinary conditions. This difficulty can be overcome if the oil is treated with an anhydrous acid mixt. within much narrower limits (about 1:2). In this case a product, m. 66°, is formed which can be sepd. from the oily, more difficultly nitrated part by cooling to 40° and allowing

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oil to drop off. A second nitration will yield a product which on being washed, melted, and neutralized, melts at 80°. A curve represents the nitration process of the first phase. W. C. COPE.

Hexanitrodiphenylamine and tetranitromethylaniline. M. GIUA. *Monitore tecnico;* through *Z. ges. Schiess-Sprengstoffw.* 10, 111–12(1915).—Both of these compds. are used in the present war by the Germans and Russians. Tetranitromethylaniline (TNMA) is preferably mixed with trinitrotoluene (TNT). (This statement is doubted by German translator, Dr. Schweizer, of Italian article as it would make TNT too sensitive.) To prep. hexanitrodiphenylamine, one starts with dinitrochlorobenzene or aniline; the dinitrodiphenylamine resulting therefrom is nitrated in 2 phases to tetranitrodiphenylamine and to hexanitrodiphenylamine. The latter is a yellow substance, m. 248°, insol. in almost all org. solvents, slightly sol. in AcOH and acetone. TNMA is obtained by nitrating dimethylaniline with HNO_3. It is a faintly yellow substance, m. 127° (decompn.). When recrystd. from C_6H_6 it m. about 130°. Its use together with TNT is based on the property of these compds. of forming within definite limits an addition product which is dissociated at the m. p. as proved by G.'s expts. A table is given showing equil. between TNT and TNMA in the solid state. The condition of equil. is graphically represented; the existence of the equil. compd. between TNT and TNMA is shown by that segment of the curve which runs parallel to the abscissa; this corresponds to a concn. limit of 15.69%. W. C. COPE.

Synthetic phenol and picric acid. A. H. NEY. *Met. Chem. Eng.* 13, 686–90 (1915).—The manuf. of synthetic phenol from C_6H_6 involves the following steps: sulfonation of the C_6H_6, conversion into Ca salts, filtering off the $CaSO_4$, conversion of Ca benzenesulfonate into the Na salt and removal of the latter from pptd. $CaCO_3$, evapn. of Na salt to dryness, caustic fusion of Na salt, soln. of fusion mixt., acidulation and sepn. of phenol from the water soln. of the salts, and distn. of the crude phenol. The synthetic product possesses a disagreeable odor, characteristic of S compds. which can be removed by digesting with or distg. over wood or animal charcoal. Picric acid is formed by sulfonating phenol with 4 parts 98% H_2SO_4 and then nitrating the cooled mixt. with 4 mol. of HNO_3. Several industrial precautions are mentioned. R. L. S.

Coal dust explosions in cement mills. L. F. HOLLY. *Concrete-Cement Age* 7, *C. M. S.* 21, 3(1915).—Dust conditions practically the same as those in mines prevail in the coal-grinding section of a cement mill. This dangerous condition can be avoided by suction nozzles which suck in the dust which is piped to dust collectors and then conveyed to the coal-storage bins. A. A. KLEIN.

The explosibility of sugar dust. WHEELER. *Deut. Zuckerind.* 40, 533(1915); *Wochschr. Zentralver. Rübenzuckerind.* 53, 469(1915).—As small a source of heat as a match may ignite a cloud of sugar dust. If a cloud of sugar or dextrin dust is blown against a hot surface, it may explode. The possibility of an explosion depends not only on the temp., but on the density of the cloud and the time the particles are in contact with the source of heat. The minimum ignition temps. found were 540° for sugar or dextrin dust, and 630° for melted sugar. W. L. BADGER.

An explosion at a dye-making works. ANON. *Chem. Trade J.* 56, 123(1915). —An explosion took place in one of the color grinding sheds, due (supposedly) to overheating of a machine containing alizarin yellow. Owing to the presence of grit or other foreign substance, the color ignited and burst a huge cylinder. One man was killed. He was charging the machine consisting of a large Fe drum and several rollers for grinding the alizarin yellow. The substance is slightly more inflammable than other colors, but an explosion had never taken place before. BERMAN.

ESCALES, R.: **Die Nitrosprengstoffe.** Leipzig: Veit & Co. $3.75.

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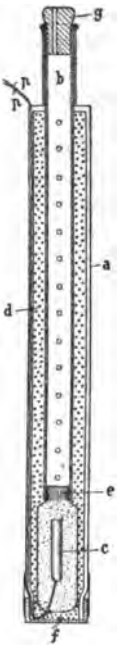
U. S., 1,157,270, Oct. 19. W. Weber. **Blasting cartridge for use with liquid air.** A primer and a small amt. of Al powder are placed in the bag *c* and the tube *a* which may be double walled and have an intermediate layer of corrugated paper between the walls is satd. with liquid air as is also a filler of cotton, cork, sawdust or other absorbent material placed within the tube *a* around the perforated tube *b*.



U. S., 1,158,217, Oct. 26. H. Hibbert. **A solvent for nitrocellulose** and similar substances, is produced by reducing acetone oil with H, using Ni, Ni oxide, Co, Co oxide or Pd as catalyzer and acetylating the alcs. produced. The product consists mainly of a mixt. of acetic esters of secondary alcs. corresponding to the ketones of the oil, has an initial b. p. of about 100° and about 50–60% of it distills at 90–160°.

Brit., 11,582, May 11, 1914. F. R. Burrows and J. G. Burrows. An **explosive** consists of a mixt. of NH_4ClO_4 6, KNO_3 56, Al 18, 2,3,4-$(NO_2)_3C_6H_2Me$ 18, and pure paraffin wax 2. The Al is prepd. by pouring the molten metal on to a rapidly revolving wheel which dashes it in a spray into cold H_2O, thus producing comparatively large particles having very sharp points or edges which render the material susceptible to rapid ignition. The α- or 2,3,4-trinitrotoluene is that obtained by the distn. of the so-called liquid trinitrotoluene and is known com. as tolite, trilite, trinol, and trotyl.

Brit., 14,004, June 10, 1914. G. Spica. In mfg. **explosives,** nitrocellulose and nitroglycerin are gelatinized by means of phenanthrene and by heat and pressure without the use of a volatile solvent. One example contains 62–6% of nitrocellulose, 28–32% of nitroglycerin, and 5–7% of phenanthrene.

Can., 164,831, Sept. 14, 1915. Wm. A. Fairburn. **Manufacture of double dipped matches** by applying to the match splints compn. heads containing an oxidizing agent as a prime ingredient, then transporting the splints thus treated through a drying zone of relatively high temp., then applying sensitive ignitible compn. to the heads, and finally, transporting the splints, thus headed and tipped, through a drying zone of relatively low temp. Cf. *C. A.* 9, 2815.

Can., 164,990, Sept. 21, 1915. J. Maire. **A gelatin explosive** consisting of a mixt. obtained by dissolving solid $(NO_2)_3C_6H_2Me$ in a product formed by nitrating a mixt. of *o*-$NO_2C_6H_4Me$, of nitrocellulose and of an oxidizing salt.

Can., 165,018, Sept. 21, 1915. J. Grorud. **Ammonium nitrate explosive** containing 50–80% of NH_4NO_3, 5–20% of metal or metal compd., 10–20% of carbonized excrements, and 2–20% of organic nitro compounds.

Ger., 283,696, Apr. 18, 1912. Martini & Hüneke, Maschinenbau-Akt.-Ges. **Preventing explosions** in tanks, such as benzine-washing machines, by introducing before the admission of the benzine, an inert gas, under pressure, such as CO_2 or N. The pressure in the app. operates a valve admitting the benzine, or other combustible liquid, when the mixt. is such that the vapors of the combustible liquid will not form therewith an explosive mixt. This pressure is chosen with respect to the desired constitution of the inert gas mixt.

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Aniline dye situation. I. F. Stone. *Met. Chem. Eng.* 13, 663–71(1915).—In this address S. reviews in detail the causes of the present shortage in coal-tar colors

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and intermediates; gives statistics of consumption and production under normal conditions and since the European war; states what American manufacturers have already done and will probably do during 1916; repeatedly shows the necessity of a more equitable tariff; and suggests the possibility of government-owned factories.

L. W. RIGGS.

Theory of dyeing. J. TRAUBE. *Ber.* **48**, 938–46(1915).—Of 65 dyes which were investigated, it was found that almost all of the basic dyes cause a gelatin gel to swell, while practically all of the acid dyes have the opposite effect. T. has shown that similar effects observed on gelatin gels are applicable to other gels (*Intern. Z. phys.-chem. Biol.* **2**, 42(1915)), and it follows that these dyes have the same effects on swollen fibers. The degree of swelling on gelatin gels was detd. by finding the time required at a given temp. for a gel, with or without the addition of a dyestuff, to pass into the hydrosol. The sinking of glass spheres was the criterion of melting. Impurities in the dyes, such as dextrin and inorganic salts, were proved to be without effect or of minor importance as compared to the dyes themselves. Highly colloidal dyes have a tendency to deposit on the surface of the swollen gels, while highly disperse dyes pass into the swollen gels. To prevent this penetration and thus obtain a better dyeing, it is necessary to produce a decrease in the degree of dispersion or to cause the formation of a surface layer of colloidal ppt. (mordants). The decrease in the degree of dispersion may be produced in acid dyes by the addition of acids and in basic dyes by the addition of bases. Highly colloidal dyes do not diffuse appreciably into gelatin gel (10%), when the gel is covered with a layer of 0.1% dye soln. Disperse dyes diffuse readily under these conditions. In a few days in the case of colloidal dyes, the solns. become clear and a thick layer of dye forms at the surface of sepn. This layer adheres even when the vessel is shaken vigorously. The dye is therefore attracted and held firmly by the gel. T. considers dyeing a colloidal process, which involves chem. changes only in so far as the dyes, on being fixed by the electronegatively or electropositively charged fibers, undergo chem. processes. The most important prerequisite is a sufficient swelling of the fibers, which may be augmented by the use of acids or bases. Fibers behave in general like negatively charged gels of different degrees of swelling.

W. F. F.

Use of Knecht's process for determining the fastness of dyes to light and other agencies. ARABINDA SIRKER. Dacca Coll., East Bengal. *J. Soc. Chem. Ind.* **34**, 598–9(1915); cf. *Ibid* **24**, 154(1905); *C. A.* **6**, 2844.—Expts. proved that the difficulties previously experienced with Knecht's process of titration with $TiCl_3$ were due to the presence of air in the app. Well washed wool was dyed in each case in a bath containing 2% dyestuff and 2% H_2SO_4 (on the wt. of the wool) by boiling 1 hr. In each titration about 100 cc. of H_2O and 15–20 cc. concd. HCl were added to the sample tested, then an excess of $TiCl_3$ and the excess detd. by titrating back with standard ferric alum soln. Every precaution was taken to exclude air. The following dyes were studied: chrysoidine, benzeneazoresorcinol, benzeneazophenol, benzeneazosalicylic acid, aminoazobenzene, benzeneazophenol-*o*-sulfonic acid, sulfobenzeneazophenol, nitrobenzeneazophenol, bromobenzeneazophenol, orange II, *o*-aminoazotoluene, benzeneazodibromoaniline. The theoretical value of 0.04 g. of each dyestuff expressed in cc. of standard $TiCl_3$ is given, also the number of cc. of $TiCl_3$ required by the bath after dyeing and the number required by 2 g. of the dyed wool. To test the fastness to soap the dyed samples were steeped 15 min. at 60° in an aq. soln. of neutral soap containing 15 g. per liter, rinsed out and titrated. For alkali fastness samples were steeped 10 min. at 60° in a soln. of $Na_2CO_3.10H_2O$ (10 g. per l.). For the acid test samples were steeped 10 min. at 40° in 10% AcOH. In discussing results benzeneazophenol was taken as the standard. Of the dyes mentioned only the first 4 showed an intensity

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of shade above 72% of the original intensity, after 59 days of exposure to light. Fastness to soaping and alkali was increased by the introduction of NH_2, CH_3, or OH groups or Br atoms, and decreased by SO_3H and COOH. Fastness to acid was decreased by the introduction of NH_2 groups, but increased by the introduction of other groups. All things considered, only Br atoms can be introduced without much bad effect. When benzene nuclei are replaced by naphthalene, fastness to soap, alkali, and acid is decreased. The washing out of dyes by soap and alkali depends largely on the presence of acidic groups in the dye. L. W. RIGGS.

The use of Turkone oil in wool dyeing. C. SCHONHERR. *Z. ges. Tex. Ind.* 17, 745(1914); *J. Soc. Dyers Colourists* 31, 170(1915).—A 5% soln. of Turkone oil requires considerable amounts of H_2SO_4 before the oil is pptd. and is hence very suitable for addition to acid liquors such as dye-baths, chroming baths, etc. It does not possess the peculiar odor of Turkey red oil and is more stable to hard water, particularly to Mg salts. Turkone oil has hence been largely used in the dyeing of piece goods to obtain level shades. It is particularly of value in the dyeing of woolen goods and the addition of $^2/_3$% to the dye-bath has been especially recommended in the dyeing of Fast Black on Marengo which is made very hard and brittle by the large amount of dyestuff and comparatively large addition of K_2CrO_4 to the wool. Turkone oil is also added to vats of Helindone colors to suppress the action of the alkali. L. A. OLNEY.

The action of some oxidizing agents on cellulose. HAROLD MOORE. *J. Soc. Dyers Colourists* 31, 180–3(1915).—The investigation was undertaken with a view to ascertaining the quant. relations which exist between the concns. of solns. of various oxidizing agents and the amt. of oxycellulose formed by the solns. under varying conditions. Two methods were used in detg. the amt. of oxycellulose formed; (1) Fehling soln. method, (2) a method based on the greater affinity of oxycellulose for several basic dyestuffs, notably methylene blue. Results are given in tabular form showing the amts. of oxycellulose formed when cotton yarn was treated at 15 and 45°, resp., with Cl bleach soln. of various concns. The effects of the addition of different amts. of HCl, AcOH and of NaOH to the Cl bleach soln. were also investigated. In other expts. $KMnO_4$ was used as the oxidizing agent; these were carried out at 15 and 35°, resp., using various concns. of $KMnO_4$. The tensile strength of cotton yarn was decreased gradually from 13.61 oz. when no bleach was used to 10.97 oz. when 15.3 g. Cl per l. were used in bleaching. L. A. OLNEY.

The action of solutions of Glauber's salt on wool and silk. N. BLAND AND M. FORT. *J. Soc. Dyers Colourists* 31, 178–80(1915).—B. and F. describe the detn. of the amt. of wool substance stripped when the fiber is boiled with Glauber's salt soln. Detns. were made by direct weighing of wool, evapn. of the ext. and the Kjeldahl method. Results of a number of detns. with cross bred yarn, Merino sliver and Botany sliver where 5 g. were heated with 150 cc. of water and 5 to 20% (weight of wool) of Glauber's salt show from $^1/_3$ to $^1/_2$% of wool substance stripped above the amt. removed by water alone. The wool treated with Na_2SO_4 was found to have a greater affinity for Crystal Scarlet than that treated with water alone. Silk treated with Na_2SO_4 soln. at a boil lost 6% of silk substance in addition to amt. lost when treated with water alone. In the opinion of the authors these results can be explained only by the neutral salt reaction as previously described by them (*C. A.* 7, 893, 4073). L. A. OLNEY.

Explosion at a dye-making works 24.

U. S., 1,154,826, Sept. 28. O. WULFF. **A red wool dye of the formula**

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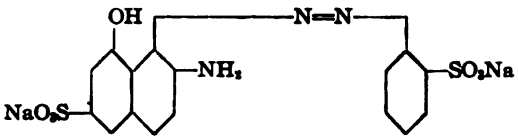


is made by combining diazotized *o*-aminobenzenesulfonic acid with 2-amino-8-naphthol-6-sulfonic acid in acid soln. It is a red powder, sol. in H_2O, very slightly sol. in alc., insol. in ligroin and petroleum and dyes wool in an acid bath fast red.

U. S., 1,155,101, Sept. 28. F. L. Schmidt. **A perborate bleaching composition** is prepd. by mixing Na perborate or other alkali perborate with about 2–10% of a mol. proportion of $MgSO_4$, $SrCl_2$, $CaCl_2$ or other alk. earth metal salt. The latter retards the decompn. of the perborate on boiling.

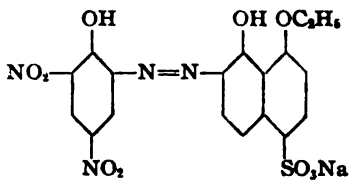
U. S., 1,155,102, Sept. 28. F. L. Schmidt. **Bleaching of textile materials, etc.,** is effected by treatment with a heated soln. of Na perborate containing a small amt. of $MgSO_4$ or other stabilizer, as in the preceding pat.

U. S., 1,155,103, Sept. 28. F. L. Schmidt. **A bleaching mixture for treating textile materials,** etc., is prepd. from Na perborate mixed with about 6% of a mol. proportion of $ZnCl_2$ which retards the decompn. of the perborate.

U. S., 1,155,104, Sept. 28. F. L. Schmidt. **Washing and bleaching textile fibers, etc., by treatment with Na perborate together with $ZnCl_2$ solns. at 110°.**

U. S., 1,155,438, Oct. 5. J. T. Paarski. **Apparatus for dyeing textile material in a circulating bath.**

U. S., 1,155,765, Oct. 5. O. Stahlin. **A mordant azo dye of the formula**



is made by combining diazotized Na picramate with Na 1-ethoxy-8-hydroxynaphthalene-4-sulfonate. It is a greenish black powder, sol. in H_2O with a violet-blue color and in H_2SO_4 with a bluish green color and dyes wool Russian-green tints when used with $K_2Cr_2O_7$ and acid.

U. S., 1,156,048, Oct. 12. R. Bohn. **Bucking textile material dyed with vat dyes.** The material is heated with a dil. NaOH soln. and Na nitrobenzenesulfonate. The latter prevents stains from spreading of printed dyes.

U. S., 1,156,462, Oct. 12. G. D. Burton. **Softening and strengthening degummed flax, ramie or similar vegetable fibers.** The degummed fibers are treated with a soln. of glycerol 2 and Na_2CO_3 1 part, dissolved in hot H_2O.

U. S., 1,156,983, Oct. 19. G. Diesser. **Silk is rendered feltable by treating** with aq. or gaseous HCO_2H and then drying.

U. S., 1,157,169, Oct. 19. C. Mettler. **A mordant-dyeing azo dye is obtained** by heating the azo dye from diazotized *o*-chloro-*m*-aminobenzoic acid, with salicylic acid and NaOH to about 150° for 10 hrs. It dyes wool from an acid bath a level yellow which is changed to a bright greenish yellow on treatment with Cr compds. It is a yellow powder, sol. in H_2O to a yellow soln. which turns to orange on adding NaOH and seps. light brown flakes on addition of HCl.

U. S., 1,157,485, Oct. 19. E. Wray. **Black vat dyes of the formula**

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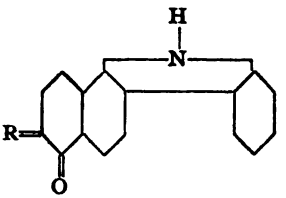

in which R stands for a monochloroisatin radical, are formed by heating α-monochloroisatin derivs., *e. g.*, the α-*p*-chloroanilide, with "pheno-hydroxy-naphtho-carbazole."

U. S., 1,157,525, Oct. 19. A. E. Gessler. **Lakes are formed by combining** $CuSO_4$, $BaSO_4$, whiting, $Al(OH)_3$, etc., with the disazo dye derived from 2,6-naphtholsulfonic acid and tetraazotized dianisidine. They are insol. in H_2O, oil, C_6H_6 and varnish and give a greenish blue soln. with H_2SO_4.

U. S., 1,157,908, Oct. 26. J. Steynis. **Aniline black dyeing** is effected by impregnating the material with a soln. containing a $PhNH_2$ salt, $NaClO_3$ and $CuSO_4$, the material is dried sufficiently to cause partial oxidation and thorough impregnation and intermittently passed over a wet lap roller and treated with a blast of dry air containing 5 g. O_3 or somewhat less per m^3, at ordinary atm. temp.

Brit., 13,455, June 2, 1914. Badische. **Azo dyes** are obtained by combining diazo, diazoazo, or tetrazo compds. free from sulfonyl or carboxyl groups with benzoyl-1-amino-7-naphthol, benzenesulfonyl-1-amino-7-naphthol, or derivs. of these compds. substituted in the benzene residue, these derivs. being free from salt-forming groups; the dyes may be produced in substance or on the fiber.

Brit., 13,467, June 2, 1914. F. Eichenberger. **Waterproofing hats,** etc., or woolen or other materials, by successively immersing in the following baths: (1) the clear soln. obtained after mixing solns. of alum and $Pb(OAc)_2$, allowing sediment to settle, and cooling to 5°; (2) a soln. of Marseille soap and Na silicate in H_2O; (3) a dil. soln. of alum in H_2O. Drying is effected in an oven.

Brit., 13,470, June 2, 1914. Cassella & Co. **Mordanting furs** by treating them with Cr compds. and HCHO, together or successively, then with $CaOCl_2$, and then dyeing them with acid wool dyes.

Brit., 13,508, June 3, 1914. A. Pinel. **Powdering locust beans** for the manuf. of gum and for use in the prepn. of dressings for thread or fabrics, by first crushing the decorticated beans in a moist state, drying the product, and again grinding in the dry state.

Brit., 13,604, June 4, 1914. Bayer & Co. **Triarylmethane dyes.** See Ger., 278,423 (*C. A.* 9, 1997). **The ethanolamines** mentioned are obtained by condensing the aromatic amines with ethylene chlorohydrin.

Brit., 13,843, June 8, 1914. Farbw. v. M. L. & B. **Monoazo dyes** are obtained by combining diazotized anthranilic acid or a substitution product thereof with a 1-Ph-3-Me-5-pyrazolonesulfonic acid or a substitution product thereof.

Brit., 14,360, June 15, 1914. Badische. **Chlorinated anthraquinoneacridones** are obtained by treating 1-arylaminoanthraquinones, containing a Me group in *o*-position to the amino group, with SO_2Cl_2 in the presence of a suitable solvent. **1,5-Di-(aminomethylphenyl)-anthraquinone** is obtained by boiling 1,5-dichloroanthraquinone with *o*-toluidine.

Brit., 14,498, Dec. 17, 1914. J. R. Foulds. **Constructional details of dyeing, washing,** or like apparatus.

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Brit., 14,869, June 20, 1914. FARBW. v. M. L. & B. **1-Amino-2-alkoxy-4-arylaminoanthraquinonesulfonic acids,** which are violet wool dyes, are obtained by condensing 1-amino-2-alkoxyanthraquinones containing acid groups in the 4-position with aromatic amines, and sulfonating the products, or by condensing the 1-amino-2-alkoxyanthraquinone derivs. with sulfonic acids of aromatic amines.

Brit., 14,954, June 23, 1914. F. ULLMANN. **4-Halo-1-hydroxyanthraquinones.** See Ger., 282,493 (*C. A.* 9, 2598).

Brit., 15,058, June 23, 1914. F. ULLMANN. **4-Chloro-1-hydroxyanthraquinone.** See Ger., 282,494 (*C. A.* 9, 2427).

Brit., 15,059, June 23, 1914. AKT.-GES. FÜR ANILIN FABRIKATION. In **dyeing,** readily dischargeable shades are obtained by combining on the fiber a diazo compd. with a 1-nitrophenyl-3-methyl-5-pyrazolone or a homolog or chloro deriv. thereof. The combinations of 1-[*p*-nitrophenyl]-3-methyl-5-pyrazolone with diazotized 2-chloroaniline, 2,5-dichloroaniline, 4-chloro-2-aminoanisole, or 1-naphthylamine give yellow, greenish yellow, yellow-orange, and brown-orange shades, resp. 1-[*m*-Nitrophenyl]-3-methyl-5-pyrazolone is also specified as a component.

Ger., 283,808, Oct. 16, 1913. KALLE & Co. Mfg. **indigo dyes** by combining with indoxyl or its derivs. the hydroxyazo dyes which can contain, as components, hydroxycarbazoles or aminonaphthols substituted or not in the amino group. Cf. *C. A.* 9, 2599.

Ger., 283,365, Nov. 25, 1913. BADISCHE. Mfg. **condensation products from *peri*-naphthindandiones,** their substitution products or derivs., by treating them with alk. condensation agents (caustic alkali). The products possess the character of dyes, and serve as valuable initial products for the manuf. of other dyes.

Ger., 283,724, Nov. 27, 1913. Addition to 272,296 (*C. A.* 8, 2953). BADISCHE. In the manuf. of **haloanthracridones,** operating as specified in 272,295 and 275,671, with the application of halogen in the form of SO_2Cl_2. The resulting haloanthracridones are valuable vat dyes.

Ger., 283,725, Dec. 23, 1913. CASSELLA & Co. **Vat dyes.** See Fr., 475,010 (*C. A.* 9, 2818).

Ger., 283,726, Oct. 12, 1913. FARBW. v. M. L. & B. Mfg. **derivatives of indirubin** by acting with NH_2OH on indirubin, its homologs or substitution products. The products are in part applicable directly as dyes, and in part as initial materials for the manuf. of such.

Ger., 283,727, Mar. 22, 1914. Addition to 275,449 (*C. A.* 8, 3243). KALLE & Co., AKT.-GES. Mfg. a **blue wool dye.** According to the parent process a blue wool dye is obtained by fusing 1-aminonaphthalene-4,6,8-trisulfonic acid with reducing S compds. in the presence of alkali. According to the modification, a similar product is obtained, by a similar treatment, with 1-aminonaphthalene-4,8-disulfonic acid, if the resulting reaction mass is freed from the reducing gas, etc., and the dye is sepd. by heating the neutralized or alk. soln.

Ger., 283,875, July 20, 1913. H. WEIL. Mfg. **Bordeaux red sulfur dyes** by heating with alkali polysulfides the red oxidation products obtained by the simultaneous oxidation of aminoaryl-*p*-sulfaminic acids and *m*-hydroxydiarylamines.

Ger., 284,181, May 23, 1913. FARBW. v. M. L. & B. Mfg. **arylaminoanthraquinone derivatives** by bringing the nitro or halogen derivs. of the oxazoles obtained by the action of BzCl on β-aminoalizarin, into reaction with aromatic primary amines, and sulfonating, if necessary. Valuable acid wool dyes are obtained.

Ger., 284,207, July 6, 1913. FARBW. v. M. L. & B. Mfg. **blue to black vat dyes of the anthraquinone series** by condensing *o*-diaminoanthraquinone with halogen

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compds. of AcH or its derivs., the product forming with the sepn. of H_2O and halogen hydride.

Ger., 284,208, Mar. 19, 1913. FARBW. v. M. L. & B. **Mfg. condensation products of the anthraquinone series containing nitrogen** by subjecting α-anthra-N-arylpyrrolcarboxylic acids to the action of acid condensation agents, such as H_2SO_4, oleum, or chlorosulfonic acid. The products serve in part as dyes and in part as initial products for the manuf. of dyes.

Ger., 284,210, May 4, 1913. Addition to 275,220. M. KARDOS. **In mfg. vat dyes of the anthracene series, instead of employing anthracene-1,9-dicarboxylic acid** imide or its halogen substitution products, as specified in the principal process, **the** aceanthrenequinone oxime or its halogen substitution products are subjected to fusion with alkali. The dye seps. out from the dild. melt upon treatment with air or other oxidizing agents.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

Manufacture and use of artificially hardened resins. O. PRAGER. *Seifensieder-Ztg.* 62, 686, 705–6(1915).—One method of hardening resins is to carry the distn. farther than ordinarily. The same result may be obtained by remelting the resin 6 or 8 times, cooling and disintegrating in the intervals. There are also 2 methods depending upon oxidation by means of air. Besides these there are the methods based on the use of oxides of metals, such as Ca, Zn, Pb, Mg, and Mn. S can also be used to the extent of 5–10% at a temp. of 150°. The product can be used as a substitute for Syrian asphalt. Resin hardened by distn. is used as brewers pitch while the oxidized resins are used to adulterate ceresin. The main use of hard resins is found in the manuf. of lacquers. E. SCHERUBEL.

Poisoning caused by vapors from waterproof paint (GRIMALDI) 11H.

U. S., 1,155,462, Oct. 5. L. E. BARTON. **A pigment containing titanium oxide** and $CaSO_4$ is made by adding $CaCl_2$ to a soln. of titanic sulfate and sepg. and calcining the composite ppt. obtained.

U. S., 1,156,079, Oct. 12. C. D. HOLLEY. **Obtaining finely divided lead** for use in making pigments. A jet of molten Pb is atomized with a jet of superheated steam and the product is collected in a settling chamber. Oxidation of the Pb may be effected by O_2 or N oxides.

U. S., 1,156,119, Oct. 12. G. WHIGELT. **A non-inflammable solvent for removing old paint** is made by mixing $C_2H_2Cl_4$ 50, dichlorohydrin 10 and dead oil 40 parts. Al palmitate or other metallic soap may be substituted for part of the dead oil Other oils and halogen derivs., *e. g.*, $C_2H_2Cl_2$ or C_2HCl_5, may be used.

U. S., 1,157,139, Oct. 19. J. ZIEBOLZ. **Turpentine-still kettle.**

U. S., 1,157,768, Oct. 26. M. FEHRINGER. **A bronze powder varnish** is formed by dissolving coumarone resin in a mixt. of benzine, gasoline, C_6H_6 and chloroethylene.

U. S., 1,158,065, Oct. 26. S. LIPSIUS. **Raised flexible printing** on bond paper in imitation of engraving is produced by printing a flat impression with an ink containing oil and pigment but no H_2O and free from quick-setting driers and then powdered shellac is fused into the printed characters. Cf. *C. A.* 9, 2459.

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U. S., 1,158,131, Oct. 26. R. HOCHSTETTER. **Ink for oscillating or rotating mimeographs** is formed of Milori blue or similar pigment which when ground in oil or varnish will hold but a small amt. of varnish, ground together with linseed oil, mixed with mineral oil, peanut and citronella oils, with or without $BaSO_4$, $MgCO_3$ or Turkey red oil.

Brit., 14,225, June 12, 1914. X. SCHÖN. Construction and operation of an app. for **cleaning used oil, varnish, and paste colors** from dirt, paint-skins, etc.

Brit., 11,394, May 8, 1914. A. HEINEMANN. **A phenol-formaldehyde condensation product** combined with As is prepd. by treating the condensate with cacodylic acid. The condensate is heated until it becomes liquid, cacodylic acid added, and the mixt. heated and stirred until thoroughly mixed. The product acts as a poison to parasites, bacteria, fungi, and manure growths, and is suitable for use in the manuf. of antifouling paints and varnishes.

27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

Chemical methods for the purification of fats and oils. E. C. SUTHERLAND. *Chem. Weekblad* 11, 344–8(1914).—A résumé of 15 patents, involving, respectively, SO_2, benzenesulfonic acid, high-boiling fatty acids, alkalies + glycerol, formaldehyde, alk. sugar solns., Al_2O_3, $Ca(OH)_2$ and fullers earth, CO_2, superheated steam and air, acetyl peroxide, BaO_2, hydrosulfites, benzopurpurin, and electrolysis with 50,000 to 100,000 volts. W. L. BADGER.

Determination of vegetable fat in animal fat. F. SCHULZE. *Arch. Chem. Mikros.* 8, 18–20(1915).—A specific case of adulteration was detected as follows: 50 g. of fat were shaken with 0.2 to 0.3 g. digitonin in alc. soln. at 50 to 70° and finally filtered after adding $CHCl_3$ to dissolve the fat. The residue was dried at 40° and acetylated with Ac_2O; the excess Ac_2O was evapd. and the residue dissolved in hot abs. alc. and crystd. several times. The m. p. of the acetates was 121° and cholesterol and phytosterol crystals were observed microscopically. E. SCHERUBEL.

Turbine lubricants. F. OTTO. *Seifensieder-Ztg.* 42, 729, 749–50(1915).—Discussion of specifications. E. SCHERUBEL.

Knorr's stearin and glycerinometer. G. S. *Seifensieder-Ztg.* 42, 743(1915).—This instrument serves for the rapid detn. of the % of stearin, olein, free fatty acids and glycerol as well as the acid no. and sapon. no. of fats and oils. It consists of 2 burets, one of which holds 135 cc. and is graduated in 4 scales as follows: (1) From 0 to 100% in tenths for free acids, sapon. no. stearin or olein by using 13.5 g. of material. (2) From 0 to 135% in tenths for fats of the coconut oil group. (3) From 0 to 11.4% for use in detg. glycerol content and (4) from 0 to 14.8% for the same purpose. The other buret is of 25 cc. capacity graduated to indicate from 10 to 270 mg. KOH and is used for detg. the sapon. no. by taking 1.35 g. of material. A free acid detn. is carried out as follows: dissolve 13.5 g. fat in 25 cc. 96% alc. and add 1 cc. of 1% phenolphthalein. Titrate the soln. with 0.5 *N* KOH from the large buret, the reading of which gives the % in the case of all ordinary fats. To det. the acid no. the figure found is multiplied by 2.08. In the case of coconut oil the reading is divided by 1.35 in order to arrive at the free acid and by multiplying this by 2.08 the acid no. is obtained. The % of glycerol is read off from scale 3 or 4. To det. the sapon. no. dissolve 1.35 g. of fat in 25 cc. alc. and add 25 cc. 0.5 *N* alc. KOH and an indicator. After boiling ½ hr. titrate the soln. with 0.5 *N* HCl from the small buret, the reading of which gives the result. E. SCHERUBEL.

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Chemical control in the manufacture of machine greases. J. DAVIDSOHN. *Seifenfabr.* 35, 750–2, 774–6, 795–7(1915).—Discussion of raw materials and their testing and analysis by well-known methods. E. SCHERUBEL.

War soap. F. G. *Seifenfabr.* 35, 773–4(1915).—Comments on the use of KOH in place of NaOH in making curd soaps. To offset the higher cost of the KOH it is claimed that a higher yield can be obtained without resorting to the addition of fillers. E. SCHERUBEL.

Manufacture of soap and washing powders. A. ENVERS. *Seifensieder-Ztg.* 42, 723–4(1915).—This is a general description. E. SCHERUBEL.

Analysis of glycerol. W. STEINFELS. *Seifensieder-Ztg.* 42, 721–3(1915).—A description is given of a well-known variation of the dichromate method in which $Na_2S_2O_3$ and starch soln. are used to titrate the I freed by the excess $K_2Cr_2O_7$. S. divides the glycerol solns. into 2 groups: those contg. a low content with high impurities, and those having high glycerol content and small amount of impurities. The first group is purified as follows: Neutralize 10 g. of soln. with AcOH if alk. and then make alk. with KOH, transfer to a 250 cc. flask and add 25 cc. of a 10% soln. of $ZnSO_4$ and enough of a 10% Pb acetate soln. so that a drop causes no further pptn. For every 10 cc. of the latter add 0.15 cc. of H_2O above vol. mark in order to take care of vol. of ppt. The glycerol detn. is made on the filtered soln. in the usual manner. The purification of the 2nd group is carried out with Ag_2CO_3. The time of oxidation can be reduced to 15 min. without affecting results by heating over direct flame. E. S.

Utilization of fatty residues in the stearin industry. H. WALTER. *Seifensieder-Ztg.* 42, 761–2(1915).—These residues result from purification, cleavage and distn. of the fats. Since the war they are treated further and utilized. E. SCHERUBEL.

Use of caustic potash in curd soaps. J. SCHAAL. *Seifenfabr.* 35, 793–5(1915).—Description of the manuf. of K soap, which does not differ materially from that of a Na soap. E. SCHERUBEL.

Household soaps during war time. E. *Seifensieder-Ztg.* 42, 741–3(1915).—Discussion of calcns. and costs. E. SCHERUBEL.

Filled soaps. E. *Seifensieder-Ztg.* 42, 700–2(1915).—Formulas and discussion of mfg. for small establishments. E. SCHERUBEL.

Washing materials. G. FENDLER. Berlin. *Seifensieder-Ztg.* 42, 697–700(1915).—In general, pure soap is the best washing material and then soda. The action of H_2O and soda soln. at room temp. upon cotton fibers with regard to ductility expressed as % of original length is shown in tabular form. The av. figure for fibers 14 days in H_2O is 18.3, and in strong Na_2CO_3, 19.0. Another table gives the tensile strength of an individual cotton fiber in H_2O and soda soln. at room temp. expressed in kg. The av. for 14 days was 12.2 for the untreated fiber, 13.1 for the fiber in H_2O and 12.8 for the soda soln. A cold soln. of the latter does not harm fibers but hot soda harms their elasticity and produces disintegration upon rubbing. Soap lubricates and protects fibers from disintegrating by hard rubbing. Sodium silicate acts in the same manner as Na_2CO_3. Fat solvents such as CCl_4 and turpentine oil are valuable and harmless aids in washing, but are not universally used because it is not possible to use them directly. There are soaps on the market which contain these ingredients such as "tetrapol" and "benzapol," contg. 15 and 12%, resp., of CCl_4 and "oxygon," contg. turpentine oil and a small amt. of soap. E. SCHERUBEL.

A new use for sugar (in soap). ANON. *Cent. Zuckerind.* 23, 853(1915); *Wochschr. Zentralver. Rübenzuckerind.* 53, 468.—Soap containing considerable amts. of sugar is claimed to wash satisfactorily some things previously considered to need chemical

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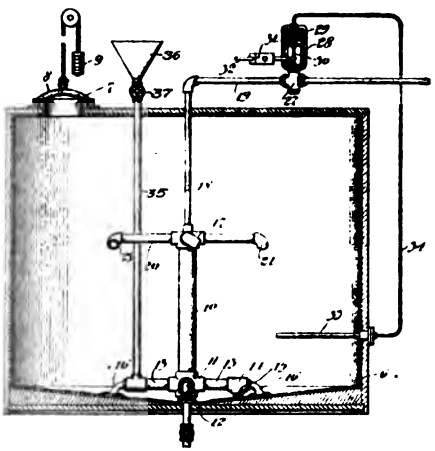
bleaching (laborers' clothes in certain industries) and yet to be suited for delicate fabrics whose colors would not be fast to ordinary soaps. It may be used in weak salt water as well as soft water. The manner in which the sugar is used in the manuf. of the soap or the reasons for its particular properties are not given. W. L. BADGER.

U. S., 1,155,194, Sept. 28. E. R. BARROW. **Sterilizing and preserving cottonseed** for treatment in oil mills. The seed is treated with about 5% its wt. of NaCl containing in mixt. about 2% of starch and 2% of $MgCO_3$.

U. S., 1,156,905, Oct. 19. P. G. KAISER and B. E. REUTER. **Apparatus for treating fats and oils with steam.** Steam from the pipe *18* is forced into the pipe *10* and out into the oil or fat in the Pb-lined vat *6* through the whirling downwardly directed elbows *21*. The steam supply is automatically controlled by the pressure in the vat acting through the pipe *34* on the valve-control device *29*. *36* is a funnel through which saponification catalysts (*e. g.*, Twitchell reagent) may be added.



U. S., 1,156,068, Oct. 12. C. ELLIS. **A catalyzer for use in hydrogenating oils** is made by mixing Ni and Cu hydroxides with oil or glycerol and passing H through the mixt. while it is heated to 270–290° to reduce the metals.

U. S., 1,156,466, Oct. 12. R. CLAUS. **Preparing fullers earth for use in purifying edible oils, etc.** The crude fullers earth is formed into bricks, allowed partly to dry in the atm. and then treated with hot gases in a closed chamber (preferably at a temp. between 120 and 300°) to complete the drying. The bricks are then disintegrated.

U. S., 1,156,674, Oct. 12. C. ELLIS. **A catalyzer for use in hydrogenating edible oils, etc.,** is made by dissolving $Ni(OH)_2$ in an ammoniacal soln., mixing with finely divided charcoal, heating to drive off the NH_3 and H_2O and reducing with H. The charcoal is charged with H at the conclusion of the process.

Brit., 11,588, May 11, 1914. K. BIRKELAND. **Refining or distilling oils, fats** and other liquids by means of steam, H, or other vapors or gases, by forcing jets of the liquid through the steam, etc., into a body of the liquid, so that the steam, etc., is carried down into the body of the liquid, the resulting emulsion being then carried to a low-pressure receptacle in which the steam, etc., together with the impurities or vapors are disengaged. A suitable form of app. comprizes an autoclave from which the emulsion is led through a reducing valve in a pipe to a low pressure receptacle, which is furnished with a heating coil and communicates with a condenser and a vacuum pump. The liquid is forced by a pump through injectors into the upper part of the autoclave. Steam is admitted by a pipe. A screen is fitted to the autoclave to allow steam which is not thoroughly emulsified to rize to the surface. The process may be used for fractional distn., and the gas may be circulated by a suitable pump.

Brit., 14,571, June 17, 1914. S. MORGENSTERN. **Purifying fats and oils,** such as train oil, herring oil, or those obtained from bones, carcasses, sewage, fecal matter, refuse, etc., and rendering them available for use in the manuf. of **soap,** by heating them with the bases of alkali or alk.-earth metals in closed vessels at temps. above

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150°. The proportion of base may be more or less than that required for saponification, and the heating is continued longer than is required for saponification. In an example, fat from fecal matter is heated with slaked lime in a closed autoclave for 6 hrs. at 200°, and the soap mass after being transformed with soda is used as household soap. The process is also applicable for the purification of the acids extd. from Russian petroleum by soda or other alkali.

Brit., 14,975, June 23, 1914. E. Burke. **A heavy metal salt of an org. acid is added to the paraffin wax used in mfg. candles. The Pb soap derived from oleic palmitic, or stearic acid may be used.**

Ger., 284,125, Nov. 15, 1913. C. Netz & Co. and F. Koch. **Defatting crude or worked fiber with fat solvents. The current of dry gas used for recovering the soln. remaining in the fibrous material after the extn. is mixed with regulable amts. of H_2O with a view to securing a fixed degree of moisture. The H_2O of condensation from the dry gas can be used for this purpose in order to return the suspended matter to the process.**

28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

Quantitative determination of *l*-glutimic acid in sugar house products. Vl. Stanĕk. Prague. *Z. Zuckerind. Böhmen* **39**, 191–7(1915).—S. proposes the following method for the quant. detn. of *l*-glutimic acid in sugar house products: Place 5 g. molasses or a corresponding amt. of any other sirupy product under exam. in a 200 cc. porcelain dish and add an amt. of approx. 50% H_2SO_4 (weighed in a small thin-walled glass dish or a capsule of Pb or Sn foil (*e. g.*, caps from wine bottles)) which is equivalent to the previously detd. alkalinity of the ash of the sample. Crush the small glass dish or flatten the Pb or Sn foil capsule and thoroughly mix the mass. Add an amt. of purified peat (*i. e.*, peat boiled with dil. HCl, washed with boiling H_2O until the test for HCl is no longer positive and extd. with Et_2O after being dried at 120°) equal to twice the wt. of the sample, mix thoroughly and transfer by means of glazed paper to the extn. tube of a Poupé extn. app. Remove the last traces of material from the porcelain dish by means of moistened wadding followed by the use of dry wadding. Add 0.5 cc. H_2O and a small crystal of $FeSO_4$ (in order to eliminate the influence of HNO_2 which may be present) to the flask (of approx. 300 cc. capacity) of the extn. app. and add sufficient Et_2O to the extn. tube to form a layer 2 inches deep above the mixt. Heat the flask in a H_2O bath and continue the extn. for 72 hrs. After the extn. is concluded distil the Et_2O and det. the N content of the residue by the Kjeldahl method, allowing the residue to remain in the original flask. One cc. of 0.1 *N* acid employed for titrating the NH_4OH which is produced is equivalent to 12.91 mg. *l*-glutimic acid. The purified peat may be used repeatedly by subsequently treating with boiling H_2O, drying and passing through a sieve. Expts. with an artificial molasses composed of 4 g. *l*-glutimic acid, 5 g. glutamic acid, 3 g. lactic acid, 1 g. AcOH, 1 g. formic acid, 5 g. betaine (the foregoing were first dissolved in H_2O and the soln. neutralized with KOH) and 50 g. sucrose in aq. soln. (final wt. of soln. was 100 g.) showed a recovery by the above method of 98.8–100.3% of added *l*-glutimic acid. Greater contents of sucrose than the above did not interfere with the extn. of *l*-glutimic acid by Et_2O and the method appears, therefore, to be applicable to sugar house products with a high quotient of purity. Expts. with aspartic acid and the leucine fraction (containing leucine, isoleucine and valine) from the hydrolysis of horn shavings indicated that the amino acids present in molasses do not form Et_2O-sol. products when the slightly alk. soln. of these sub-

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stances is heated. The presence of Et_2O-sol. substances other than glutimic acid in molasses was not definitely disproved although S. did not succeed in isolating such a substance, except in 1 case in which a substance with N content equal to approx. 3% of the N content of the total Et_2O-sol. material was isolated; this substance probably consisted almost exclusively of glutamic acid. Molasses from the campaign of 1910–11 was found by this method to contain 5–7.8% glutimic acid as compared with 3–4.7% in samples from the campaign of 1911–12; this variation is probably dependent on the nature of the prevalent weather conditions during growth of the beets.

H. S. PAINE.

The degree of accuracy attainable in establishing constants for the double polarization method using acid or invertase. H. PELLET. *Intern. Sugar J.* **17**, 421–3 (1915).—P. finds that it is impossible to establish constants for the inversion of 1% sugar solns. showing differences within 0.06. This latter figure occurs as a difference in the table of constants worked out by E. Saillard as the result of expts. with the Ogilvie method of inversion. Using a 400 mm. tube, an error as great as 0.8 may occur when operating with a saccharimeter whose normal wt. is 16.29 g. and with one of 26 g., the error may be 1.3. A conformity of results cannot be expected because of differences in app. and methods of operation. To obtain satisfactory results it is necessary, (1) to carry out 2 or 3 expts. to establish the constants for solns. giving sensibly the same polarization as the liquid under analysis, (2) similarly to make 2 or 3 detns. upon the liquid under analysis, (3) to employ the same calibrated flasks and also the same pipet, (4) to utilize the same saccharimeter tube placing it in the same position for every reading, and (5) to arrange the cover glasses always in the same position (marking them to assure this).

A. GROSS.

A study in the chemical control of cane sugar factories. II and III. N. DEERR. *Intern. Sugar J.* **17**, 407–11(1915).—A continuation (cf. *C. A.* **9**, 2991). A detn. and comparison of the values of the grav. solids, refractive solids and abs. solids, these terms being used by D. to denote the "solids" correspondingly, resp., to the degree Brix, to the refractive index and to the dry substance. A selection of the results obtained given in 4 tables shows that the order of magnitude is regularly, (1) grav. solids, (2) refractive solids, (3) abs. solids, and that the differences are fairly well maintained. The detns. of molasses were made at a concn. of about 12% abs. solids and the results indicate that the relative values of the degree Brix and the abs. solids of a molasses referred to the original concn. show a wide divergence, depending on the concn. at which the grav. solids are detd. This fact follows from the results noted in the previous paper (*l. c.*) which show that the grav. solids when calcd. back to the original concn. vary with diln. Here very possibly lies the cause of the apparent discrepancies which will be noted by anyone who has compared the results recorded by a group of factories. The solids balance is given as the comparison of the quantities, (*a*) wt. of raw juice × % solids, and (*b*) wt. of molasses × % solids + wt. of raw sugar × % solids + wt. of press cakes × % solids. The meaning of this balance offers no difficulty when referred to the abs. solids, but is likely to be confusing and indefinite when referred to the grav. or refractive solids. Some rational concn. applicable to all products must be fixed for this detn.; it appears *a priori* to be one at which the concn. of the nonsugars is the same in all the products under examn. When detd. under this condition there should be an exact balance of the grav. and refractive solids as between a juice sepd. into raw sugar and molasses. As the result of expts., D. feels justified in suggesting that the grav. solids and refractive solids balances of the cane sugar house be referred to the detn. of juice, raw sugar and molasses in an equal concn. of nonsugar. The results of an attempt to obtain a rational solids balance in a certain sugar house on the basis as developed by D. are given in detail.

A. GROSS.

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The making of sugar in Louisiana with special reference to white sugar. IV. C. E. COATES. *Louisiana Planter* **55**, 186–8(1915); cf. *C. A.* **9**, 2992.—C. finds in the various centrals, a lack of means for making careful estimates of the actual wts. of satn. water, dil. juice and of the cane fed to the mill. As calcns. are still largely used for this purpose, formulas based on the work of Prinsen-Geerligs, Deerr and others are given. On the subject of satn., C. agrees with Pellet in a number of his conclusions (*C. A.* **9**, 1132, 1701), but believes it better practice to get the satn. water on the bagasse as soon as possible. It was found difficult to break the blanket to let the water get at the lower layers (as suggested by Pellet) and rearrange it for a regular feed to the next mill. Hot satn. water is considered best for low fiber cane. A. GROSS.

Five years of beet sugar manufacture. L. RADLBERGER. *Oesterr. Chem. Ztg.* **18**, 120–4(1915).—R. discusses the progress made in the beet sugar manuf. from the economic, technologic and analytical standpoints. ARTHUR LEDERER.

The purity of the sirup adhering to raw sugar. TH. KOYDL. *Z. Ver. Zuckerind.* **65**, 226–9(1915).—Herzfeld found (cf. *C. A.* **9**, 1853) purities of 58.1 to 76.5, av. 66.8, by his method (washing with satd. sugar soln., cf. *C. A.* **6**, 1548). K. finds, by detns. by his alc. method extending over 10 yrs., purities from 57 to 78, av. 66.1. The supersatn. coeffs. calcd. from H.'s data range from 1.03 to 2.34, av. 1.51; by K.'s method they range from 1.04 to 1.16, av. 1.11. No explanation is offered for the coincidence of the methods on purities and their divergence on supersatn., except that figures for supersatn. from both methods involve calcns. which tend greatly to increase the exptl. error in the original detns. K. repeats that though the crystal content of raw sugars does not directly det. the refinery yield, yet it runs so nearly parallel to the yield that it should serve as a method of accounting in the refinery after the detn. of the proper coeffs. W. L. BADGER.

Experiments on the continuous centrifugal clarification of refinery liquors. J. HAMILL. *Intern. Sugar J.* **27**, 419–20(1915).—The inventor claims that his machine successfully collected and discharged impurities at the desired points while in operation at full speed. A. GROSS.

The development of the cane mill in Cuba. JAMES H. DOD. *Louisiana Planter* **55**, 168–70(1915).—A history of the different types of cane mills. A. GROSS.

Short notes from practice. Results of analyses of molasses from Bulgarian sugar factories. C. D. MANZOFF AND M. NICOLOFF. *Z. Nahr-Genussm.* **30**, 101 (1915). LOUIS D. ELLIOTT.

Ammonia as a by-product in sugar factories. ED. DONATH. *Oesterr. Chem. Ztg.* **18**, 112–4(1915).—D. discusses the sources of NH_3 in the various stages of beet sugar manuf. and the patents aiming at its economic production from these sources. The problem is yet unsolved. ARTHUR LEDERER.

Saccharification of starch by hydrofluoric acid. EDUARD KUNZ. Tech. Hochschule, Munich, 1913, *Dissertation;* through *Z. Spiritusind.* **38**, 297–8, 306(1915).—The paper may be summarized as follows: The inverting power of HF is only $^1/_{17}$ of that of HCl. At low HF concns. and boiling under atm. pressure, a higher sugar degree is obtained only after an unproportionate length of time. Increase of pressure and consequently of b. temp. shortens the time, but favors on the other hand the decompn. of the sugar formed. Increasing the acidity results in a rapidly increasing decompn. and reversion of dextrose. HF, therefore, is much less suitable for the starch inversion than the acids commonly employed, especially HCl and H_2SO_4. L. W. HAAS.

Is the "stiffening" (of starch) an equilibrium process controlled by mass-action? J. R. KATZ. *Verslag Akad. Wetenschappen* **23**, 1150–9(1915).—Further expts. were

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carried out on the properties of wheat starch with respect to water. The results obtained lead to the conclusion that the swelling and stiffening of starch in water is an equil. process, the limiting condition thus depending on the temp. and on the relative amt. of H_2O present. L. H. ADAMS.

Cement for polarimeter tubes (PATTERSON) 1. Device for emptying centrifugals (EBERHARDT) 1. Use of sugar in soap 27. Explosibility of sugar dust (WHEELER) 24. Refractories for lime kilns and pulp driers (RICHTER) 19. The sugar beet and the products derived from it as raw materials for bread making (NEUMANN) 12. Fermented molasses as source of fertilizer (AITA) 15.

PAGES, G.: **Le sucre et l'utilisation de ses sous-produits a la ferme.** Paris: Hachette. 1.50 fr.

U. S., 1,155,806, Oct. 5. H. C. GORE and C. O. TOWNSEND. **Sirup from sugar beets** is made by removing the crowns of the beets, washing and cutting up the beets and heating them to near the b. p. of the juice to ext. sugar from the pieces, boiling down the soln. obtained, first slowly and then b. rapidly to remove the objectionable flavor and finish the concn.

U. S., 1,156,060, Oct. 12. F. E. COOMBS. **Sugar solutions** are defecated by liming the juice and heating under pressure and then centrifuging while the soln. is still at a temp. of nearly 100°.

U. S., 1,156,801, Oct. 12. C. C. MOORE. **Starch.** See Brit., 530 (*C. A.* 9, 1855).

U. S., 1,157,738, Oct. 26. C. A. TYLER. **Cold laundry starch** is prepd. by cooking raw starch by passing steam through it to agitate it at the same time it is cooked and then passing cool air through it to agitate and cool the cooked starch.

Brit., 13,602, June 4, 1914. E. SHAW. App. for **concentrating sirups,** etc.

Brit., 13,364, May 30, 1914. J. C. GRIERE. In **sugar manufacture,** a continous process for the direct conversion of a soln. of sugar or similar substance or a massecuite containing crystals into a dry and friable product consists in treating a supply of hot concd. soln. with a supply of friable pptg. substance regulated according to the quantity and concn. of the soln. supplied. The pptg. substance may be derived from the partially finished product, or it may be sugar in grains or a foreign substance such as kieselguhr, sand, alumina, or powdered boneblack. The foreign substance may be left in the finished product, or may be sepd. by any known method when the sugar is remelted. The hot paste so formed is then subjected to a kneading process and afterwards treated in primary and secondary drying appliances. In the primary drying app., the mass is agitated and exposed to the action of hot air partly satd. with moisture, while in the 2nd app. the mass is subjected to energetic agitation and mixing and to the action of cold air. The mass may be sifted between the 2 drying operations, and may be further heated by a current of hot air before sifting. After drying, the product is treated with moist air to give it its natural amt. of hygroscopic moisture and is simultaneously cooled. This may be carried out by allowing the product to fall over refrigerating surfaces, on which moisture from hot moist air passing through the app. is allowed to condense. The process may be varied by compressing the paste received from the kneading app., the moist blocks so formed being dried in a current of cold air or *in vacuo*. The process may also be modified by introducing at any stage a decomposable solid or liquid or a gas for the purpose of varying the compn., taste, or color of the final product. The raw soln., after being treated in a concen-

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trator supplied with heating steam under const. pressure, passes to a regulating chamber fitted with a weir so shaped that the flow is directly proportional to the height of liquid above the weir. The regulating chamber is further provided with a float adapted to operate the valve controlling the supply of soln. to the concentrator and also to control the rate of delivery of the pptg. material.

29. LEATHER AND GLUE.

LLOYD BALDERSTON.

The tannery fifty years hence. J. R. BLOCKEY. *Leather Trades' Year Book* 1915, 186–93; *J. Am. Leather Chem. Assoc.* 10, 489–95(1915).—Forecast of probable lines of progress. L. B.

Dressing of wool and hair rugs. H. BRUMWELL. *Leather Trades' Year Book* 1915, 157–60; *J. Am. Leather Chem. Assoc.* 10, 496–9(1915).—The substitution of neradol tannage for alum "tawing" gives a more water-resistant product, and one which is in no respect inferior to that produced by the older process. L. B.

Impressions of Dutch West Borneo. A. T. HOUGH. *Leather Trades' Year Book* 1915, 117–27; *J. Am. Leather Chem. Assoc.* 10, 499–506(1915).—Manufacture of tanning extract from mangrove bark is described. L. B.

Dry glue or liquid glue? E. SAUER. Memmingen in Bay. *Kolloid-Z.* 16, 148–50(1915).—Since more than half the cost of manuf. of glue comes in drying out the 40% gel it would be advantageous to manufacturer as well as consumer if liquid rather than dry glue were put on the market. The objection to this is that the quality of a liquid glue cannot be detd. by inspection as that of dry glue can. To overcome this objection it would be necessary to label the liquid glue with the % of dry glue and regulate the price accordingly, and to give the binding power (in terms of viscosity or m. p.) of the dry glue. H. I. MATTILL.

The newer tanning theories. R. LAUFMANN. Freiberg. *Kolloid-Z.* 17, 37–44 (1915).—A review. H. I. MATTILL.

The biological testing and evaluation of tanning materials. R. KOBERT. Univ. Rostock. *Ber. pharm. Ges.* 24, 470(1914); *Collegium* 1915, 321–31.—The procedure followed embodies the use of 2–5% suspensions of several kinds of blood, as also 1–2% suspensions of serum-free blood corpuscles and others of low serum content. Ordinarily, batteries of 7 test tubes were prepd., each containing 5 cc. blood or corpuscles. For control purposes test tubes 1 and 7 contained in addition 5 cc. physiol. NaCl soln., while the remaining 5 were given mixts. of tannin (or tanning material) and physiol. NaCl soln. amounting to 5 cc. for each tube. After being tipped once, the tubes are allowed to stand at room temp. not longer than 24 hrs., whereupon results are noted. It was shown that if the tannin is present in quantity just sufficient to exercise a max. of activity, it disappears completely from the liquid itself, agglutination having taken place, thereby yielding a colorless liquid on filtration. In the case of Merck's tannin, a 1% suspension of blood corpuscles effected complete agglutination within 24 hrs. in dilns. of 1:25000, while with oak bark tannin a diln. of 1:20000 produced a like result. During this process the tannic acid is changed into gallic acid. The ability to hydrolyze tannic acid is inherent in the cells of various organs, particularly those of the intestinal mucosa and in a high degree. Since gallic acid itself effects agglutination, the procedure indicated above may be employed to det. approx. the tannin in any tanning material. Similar results were noted in the case of eutannin, the tannic acids of pomegranate, areca, logwood and rhatany. An examn. of the artificial tanning

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material neradol D. in acid soln. showed differences in behavior toward serum-free blood corpuscles, depending on the quantity added. Either hemolysis without decoloration and formation of a ppt., or agglutination with or without partial hemolysis and production of grayish flakes, or finally total agglutination with no intermediate stages resulted. The clear supernatant liquid reacted with $FeCl_3$ but not with gelatin. In non-neutralized solns. hemolytic activity of neradol attains a limit in dilns. of 1:12500 while its agglutinative power is limited to 1:2000; in neutralized solns. the limit of diln. for hemolysis is 1:20000, all calcd. to the dry substance, which constitutes 50% of neradol, about 33% consisting of tanning material. Neutralized neradol effects complete hemolysis in both large and small doses, thus behaving more like the saponins than the non-neutralized product, which ppts. serum, though in less degree than tannin. Neutralized neradol has no effect on serum. It is only slightly toxic, resembling in this respect certain phenols. W. O. E.

Gravimetric determination of tannic acid in tanning materials. A. Gawalowski. *Z. anal. Chem.* **54**, 403–5(1915).—The substance is first extd. with EtOH and Et_2O, giving a soln. containing the tannic acid and resin. Evap. an aliquot portion of the ext. to dryness, ext. with H_2O, ppt. the resulting tannic acid with $Cu(AcO)_2$ soln. and collect the ppt. on a weighed filter, dry and weigh. Ignite the ppt. in air or O, reduce the CuO with H; calc. the wt. of tannic acid from the wt. of total ppt. and wt. of Cu, correcting for the H atoms replaced by Cu. Hager's CuO factor for tannic acid is not admissable; G. finds factors ranging from 1:24 to 4.25 for various materials. George W. Morey.

Stickelberger, E.: **Versuche e. Geschichte der Gerberei.** Berlin: J. Springer. 95 ss. 8 M.

U. S., 1,154,762, Sept. 28. J. J. Gross. **A tanning composition from waste sulfite liquor** is made by treating the liquor while warm with HCl and H_2SO_4 and adding K_2CrO_4 to ppt. remaining Ca from soln., concg. the purified soln. to about 20° Bé., cooling it with air, filtering from the ppt. thus formed and further concg. to any desired consistency. A product of 30° Bé. contains about 32% of tanning substances.

U. S., 1,157,952, Oct. 26. J. Moszynski. **Tanning leather.** The hides are immersed in a bath of H_2O containing cutch ext. 10 lbs., and chestnut ext. 10 lbs. reduced to 25° "barkometer," then in H_2SO_4 of 30° "bkm." for 3 days and then replaced in a bath of cutch and chestnut exts. of the original strength at first, the strength afterward being increased by addition of fresh ext. Then they are placed in a 25° Na_2CO_3 soln. at a temp. of about 52° for 15 min., then in 30° H_2SO_4 and finally treated with cold H_2O, dried and H_2O-proofed.

Brit., 14,868, June 20, 1914. Anhydrat-Leder-Werke Akt.-Ges. and K. Haring. In the **impregnation of fabrics,** the principle of the process of 28,392, 1912 (*C. A.* **8**, 1886), for introducing molten material of considerable viscosity into prepd. skin and finished leather, is applied to fibrous material of any kind. Felt, or a woven material of wool, cotton, hemp, linen, jute, or the like may be used, a substitute for sole leather for making driving belts, a material for excluding H_2O, or an elec. insulating material being obtained. The process consists in impregnating the fabric with a soln. of a suitable filling material and then introducing the satd. fabric into a fused mass adapted to be dissolved in the solvent used in the soln. Asphalt, petrol goudron, resin, caoutchouc, gutta-percha, and paraffin of high m. p. are mentioned. Linseed oil varnish may be added to produce a gradual hardening effect. Benzene is mentioned

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as a solvent. To impart additional solidity the fabric may be impregnated with a soln. of cellulose, such as celluloid, cellite, or acetylcellulose. Cf. *C. A.* 9, 725.

Brit., 14,031, June 10, 1914. L. P. MORIN. **A machine for softening skins** in the manuf. of leather.

30. RUBBER AND ALLIED SUBSTANCES.

R. T. STOKES.

LOCK, R. H.: **Rubber and Rubber Planting.** New York: G. P. Putnam's Sons. 245 pp. $1.50.

U. S., 1,156,184, Oct. 12. P. SCHIDROWITZ and H. A. GOLDSBOROUGH. **A porous or spongy rubber article** is made by coagulating rubber latex while in a spongy mass (produced, *e. g.*, by action of $(NH_4)_2CO_3$ and HOAc) and then fixing the form of the coagulum by vulcanization, *e. g.*, with CS_2, S and steam.

U. S., 1,156,561, Oct. 12. S. T. SMITH. **A mixture for coating and preserving rubber** is formed of cacao butter 2 oz., castor oil 2 oz., and gasoline 2 qts.

U. S., 1,157,177, Oct. 19. S. J. PEACHEY. **Vulcanization of natural or artificial caoutchouc** is accelerated by the addition of about 0.5% of *p*-nitrosodimethylaniline *p*-nitrosomethylaniline or *p*-nitrosoethylaniline.

U. S., 1,157,572, Oct. 19. F. MOENCH. **Vulcanizing rubber and simultaneously attaching it to glass, iron, tin, porcelain** or other material. Rubber soln. is applied to the surface to be united to the rubber, the soln. is allowed to dry and the dry coating is scratched into the surface of the article. Then unvulcanized rubber is applied to the scratched surface with heat and pressure and after relieving the pressure the heating is continued for 1 hr. at about 160° to vulcanize the rubber and effect firm attachment.

U. S., 1,157,887, Oct. 26. E. E. A. G. MEYER. **Rubber** is vulcanized by heating after preliminary pressing in a mold at a temp. sufficient to soften the rubber for 5–45 min. to compact the material and express gas bubbles. The pressure is released before raising the temp. to the vulcanizing point.

Brit., 11,421, May 8, 1914. A. LAMBRETTE. Construction and operation of **autoclave vulcanizing presses.**

Brit., 13,440, June 2, 1914. MANNESMANNRÖHREN-WERKE. A **composition for coating metals** is prepd. by adding S or SCl_2 in small portions to a heated mixt. of 1 part of oil, such as linseed or rape oil, and 1 part of resin, until the mixt. can be drawn out into threads and on cooling becomes similar to rubber, then dissolving the product in 1 part of tar oil or other solvent such as CCl_4, CS_2, benzene, and low boiling fractions of crude petroleum, and adding 5 parts of coal tar free from H_2O. Alternatively, the rubber-like product may be dissolved in volatile solvents such as those mentioned above and mixed with a soln. of asphalt in more solvent.

Brit., 13,779, June 6, 1914. C. PACCHETTI. **A vulcanized mixture of rubber and lengths of horsehair** or hog hair or bristles is used for making tires and other articles.

Brit., 14,355, June 15, 1914. W. P. BRADLEY. **Rubber thread** is made from a mixt. of high-grade rubber stock or substantially pure rubber, lamp-black, and ceresin wax, each of the two last mentioned being preferably in the proportion of 2 to 7% as compared with the rubber.

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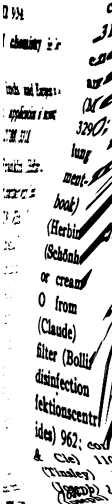

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LIST OF OFFICIAL ABBREVIATIONS

[α] specific rotation ([α]$_D^{20}$..for 20° and sodium light)
abs. absolute
Ac acetyl (AcH, acetaldehyde; AcOH, acetic acid)
a. c. alternating current
alc. alcohol
alk. alkaline
Am amyl
amp. ampere
amt. amount
app. apparatus
approx. approximately
aq. aqueous
at. atomic
atm. atmosphere(s), atmospheric
at. wt. atomic weight
av. average
b. (followed by a figure denoting temperature) boils at, boiling at (similarly b_{13}, at 13 mm. pressure)
b. p. boiling point
Bu butyl (normal)
Bz benzoyl (BzH, benzaldehyde; BzOH, benzoic acid)
cal. calorie(s)
calc. calculate
calcd. calculated
calcg. calculating
calcn. calculation
cc. cubic centimeter(s)
chem. chemical
cm. centimeter(s)
coeff. coefficient
com. commercial
compn. composition
compd. compound
concd. concentrated
concn. concentration
cond. conductivity
const. constant
cor. corrected
c. p. candle power
c. p. chemically pure
cryst. crystalline
crystd. crystallized
crystn. crystallization
cu. m. cubic meter(s)
d. density (d_{13}, at 13°; d_4^{20}, at 20° referred to water at 4°)
d. c. direct current
decompn. decomposition
deriv. derivative
det. determine
detd. determined
detg. determining
detn. determination
dil. dilute
diln. dilution
distd. distilled
distg. distilling
distn. distillation
elec. electric
equil. equilibrium
equiv. equivalent
est. estimate
estd. estimated
estg. estimating
estn. estimation
Et ethyl (Et_2O, ethyl ether)
evap. evaporate
evapd. evaporated
evapg. evaporating
evapn. evaporation
examd. examined
examg. examining
examn. examination
expt. experiment
exptl. experimental
ext. extract
extd. extracted
extg. extracting
extn. extraction
f. p. freezing point
g. gram(s)
h. p. horse power
hr. hour
inorg. inorganic
insol. insoluble
kg. kilogram
kw. kilowatt
l. liter
lab. laboratory
max. maximum

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m. meter(s); (also followed by a figure denoting temperature) melts at, melting at
Me methyl (MeOH, methyl alcohol)
min. minute(s)
mixt. mixture
mol. molecule, molecular
mols. molecules
mol. wt. molecular weight
m. p. melting point
n index of refraction (n_D^{20}, for 20° and sodium light)
N normal
org. organic
p. d. potential difference
Ph phenyl
ppt. precipitate
pptd. precipitated
pptg. precipitating
pptn. precipitation
Pr propyl
prep. prepare
prepd. prepared
prepg. preparing
prepn. preparation
qual. qualitative
quant. quantitative
recrystd. recrystallized
resp. respectively
sapon. saponification
sapond. saponified
sapong. saponifying
sat. saturate
satd. saturated
satg. saturating
satn. saturation
sec. second(s)
sep. separate
sepd. separated
sepg. separating
sepn. separation
sol. soluble
soln. solution
soly. solubility
sp. specific
sp. gr. specific gravity
sq. cm. square centimeter(s)
sym. symmetrical
temp. temperature
U. S. P. United States Pharmacopeia; United States Patent
v. volt(s)
vol. volume
w. watt(s)
w. p. c. watts per candle
wt. weight

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LIST OF PERIODICALS ABSTRACTED

Each of the 671 periodicals listed below is examined systematically and abstracts are published of all original papers which may be considered as possibly new contributions to chemistry in any of its phases. If anyone knows of a publication which is likely to contain such papers and which is not in this list, the editor will appreciate hearing of it. In addition to the full titles and official abbreviations the dates of appearance, 1915 volume, price and name and address of the publisher are given, the last so that originals can be conveniently ordered in case more than the abstract is wanted. In a few cases this additional information has been omitted because of the fact that the periodicals concerned have, in so far as can be determined, been discontinued, apparently on account of the war. These have been retained on the list because some of them may be expected to be published again later. A dagger (†) after the title is used to indicate the discontinued ones.

Title and Order.—In the full titles given, the letters which constitute the official abbreviation used in the abstracts are printed in black type. Thus, the abbreviation of The American Journal of Science is *Am. J. Sci.*

The names of the periodicals are arranged in the alphabetical order *of their abbreviations.*

Dates of Appearance.—The following symbols are used: *a* annual, *sa* semiannual, *q* quarterly, *bm* bimonthly, *m* monthly, *sm* semimonthly, *bw* biweekly, *w* weekly, *sw* semiweekly, *irr* irregular.

Volume.—If the number of volumes per year is other than 1, the number is next given. The volume number of the first issue in 1915 is printed in black type; if the first issue is not number 1 of the volume its number is given in parenthesis after the volume number. In some cases the "whole number" is given in this way. If the volume number belongs to a new series, this is indicated in brackets placed before the volume; thus, [3] **29** (4), states that the first issue in 1915 is number 4 of volume 29 of series 3.

Price.—The abbreviation *d* following a price means "domestic" (that is, in the country of publication); *f* means "foreign" (Postal Union). Prices in parenthesis are for single numbers; prices not so enclosed, unless otherwise stated, are for a *year's* subscription. In some instances an asterisk is used to indicate that the members of some organization enjoy a lower rate than that given. M = mark ($0.238), pfg. = pfennig (1/4 cent), F = franc ($0.193), L = lira ($0.193), K = krone (Austria-Hungary, $0.203), or krona (Sweden, $0.268), R = ruble ($0.515), G = gulden ($0.402), s. = shilling ($0.243), d. = penny (2 cents).

Publisher.—The name and address of the publisher or person to whom orders are to be sent are given in italics.

Example.—Full title of periodical, The American Journal of Science. Abbreviation, *Am. J. Sci.* Monthly, two volumes a year. The first issue in 1915 is volume 39, No. 229. Price of a year's subscription, $6 in the United States, $6.25 in Canada, $6.40 anywhere in the Postal Union. Subscriptions may be sent to New Haven, Conn.

Great pains have been taken to make the following information strictly accurate, but it is collected from many sources and the editor will not hold himself responsible for errors in it.

Agricultural Experiment Stations (of the various states), **Bulletins, Circulars and Technical Papers.** *A. C. True, Office of Expt. Stations, U. S. Dept. of Agriculture, Washington, D. C., or the Directors of the individual stations.*

Agricultural Gazette of New South Wales, The. *m* **26.** (6d.)*d. Minister of Agriculture, Sydney, N. S. W.*

Agricultural Journal of India, The. *q* **10.** R6 (R2)*d* and *f. Messrs. Thacker, Spink & Co., Calcutta, India.*

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Agricultural Journal of the Union of South Africa, The.†

Algemeen Syndicaat van Suikerfabrikanten in Nederl-Indie. With Arch-Suikerind., etc.

Allgemeine Forst- und Jagd-Zeitung. *m* **91.** M16*d*. *J. D. Sauerlander, Frankfurt am Main.*

Allgemeine Zeitschrift für Bierbrauerei und Malzfabrikation. *w* **48.** K12*d*, K12 and postage, *f*. *Berein Osterreich. Versuchs-station und Akademie für Brau- und Malsindustrie in Wien, Michaelerstrasse Nr. 25, Wien XVIII/1.*

American Brewers' Review. *m* **29.** $5($.50)*d*, $6*f*. *American Brewers' Review Co., 327 S. La Salle St., Chicago, Ill.*

American Druggist and Pharmaceutical Record. *m* **68.** $1*d*. *62–8 W. Broadway, New York City.*

American Fertilizer, The. *bm* 2 vols. (1) **42.** $2($.25)*d*, $3*f*, $2.50 Can. *Ware Bros., 1010 Arch St., Philadelphia, Pa.*

American Food Journal, The. *m* **10.** $2($.15)*d*, $2.50*f*. *15–21 S. Market St., Chicago, Ill.*

American Gas Light Journal, The. *w* 2 vols. **102.** (2063). $3*d*, $5*f*. *E. P. Callender, 42 Pine St., New York City.*

American Journal of Anatomy, The. *bm* **17** (2). $5*d*, $5.50*f*. *Wistar Institute, 36th St. and Woodland Ave., Philadelphia, Pa.*

American Journal of Botany. *m* **2.** $4*($.50)*d*, $4.40*f*. *Brooklyn Botanic Garden, Brooklyn, N. Y.*

American Journal of Diseases of Children. *m* **8.** $3($.30)*d*, $3.35($.30)*f*. *American Medical Association, 535 N. Dearborn St., Chicago, Ill.*

American Journal of the Medical Sciences, The. *m* 2 vols. **149** (513). $5*d*. *Lea & Febiger, Philadelphia and New York.*

American Journal of Pharmacy. *m* **87.** $3($.25)*d*. *145 N. 10th St., Philadelphia, Pa.*

American Journal of Physiology, The. *m* 4 vols. **37.** $5.50 per vol., $22 per year, *d*, $23*f*. *Washington Univ. Med. School, St. Louis, Mo.*

American Journal of Public Health. *m* [N. S.] **5.** $3($.30)*d*, $3.50($.80)*f*, $3.25 Can. *Selskar M. Gunn, 755 Boylston St., Boston. Mass.*

American Journal of Science, The. *m* 2 vols. **39** (229). $6*d*, $6.25 Can., $6.40*f*. *New Haven, Conn.*

American Machinist. *w* 2 vols. **42** $4($.15)*d*, $5.50 Can., $7*f*. *Hill Publishing Co., 10th Ave. and 36th St., New York, N. Y.* Same as **Maschinenbau,** which see.

American Medicine. *m* [N. S.] **10.** $1*d*. *American Medical Publishing Co., Burlington, Vt.*

American Naturalist, The. *m* **49.** $4($.40)*d*. *Science Press, Lancaster, Pa.*

American Perfumer and Essential Oil Review, The. *m* **10.** $1($.10)*d*, $2($.20)*f*. *Perfumer Publishing Co., 80 Maiden Lane, New York City.*

American Photography. *m* **9.** $1.50($.15)*d*, $2.25*f*. *American Photography Publishing Co., 221 Columbus Ave., Boston, Mass.*

Anales de la sociedad espanola de fisica y quimica. *m*, except Aug. and Sept., **13** (119). 15 pesetas, *d*. *D. Ramón Llord y Gamboa, Calle de Jorge Juan, num. 59. Madrid, Spain.*

Anales de la sociedad quimica Argentina. *q* **3.** *Rue Carlos Pellegrini, 62, Buenos Aires, Argentine Rep.*

Analyst, The. *m* **40** (466). £1,1s(2s)*d*. *Simpkin, Marshall, Hamilton, Kent & Co., Ltd., 2, 4, 6, 8, Orange St., London, S. W., England.*

Anatomischer Anzeiger. *Irr* about 3 vols., 24 nos. per vol. **47** (20). M16*d*. *Gustav Fischer, Jena.*

Anatomical Record, The. *m* **9.** $3*d*, $3.25*f*. *Wistar Institute, 36th St. and Woodland Ave., Philadelphia, Pa.*

Annalen der Chemie, Justus Liebig's. *sm* 4 vols. of 3 nos. each. **407** (2). M24*d*. *C. F. Winter'sche Verlagshandlung, Leipzig, Rossstr. 6.*

Annals of Botany. *q* **29** (113). 30s(14s)*d*, (15s6d)*f*. *Humphrey Milford, Oxford University Press, Amen Corner, London, E. C.*

Annales de chimie. *m* 2 vols. **8.** F28*f* (or F45*d* and F50*f* for both Ann chim. and Ann. phys.). *Imprimerie Gauthier-Villars et Cie, Quai des Grands-Augustins, 55.*

Annales de chimie analytique et revue de chimie analytique. *m* **20.** F10(F1)*d*, F12(F1)*f*. *C. Crinon, 20, Boulevard Richard-Lenoir, Paris 11e.*

Annali di chimica applicata. *sm* 2 vols. **3** (1 and 2). L30*d*, L34*f*. *G. Paterno, Via Panisperna N. 89b, Roma.*

Annales de chimie et de physique. Now two separate journals, Ann. chim. and Ann. phys., which see.

Annales des falsifications. *m* **8** (63). F20(F2)*d*, F22.50(F2)*f*. *56 Rue Madame, Paris VI.*

Annuaire géologique et minéralogique de la Russie.†

Annales de l'institut Pasteur. *m* **29.** $4*d*. *Masson & Cie, 120 Blvd. St. Germain, Paris.*

Annales des mines.†

Annales de physique. *m* 2 vols. **8.** F25*d*, F28*f* (or 45*d*, F50*f*, for both Ann. phys. and Ann. chim.). *Imprimerie Gauthier-Villars et Cie, Quai des Grands-Augustins, 55.*

Annalen der Physik. 15 nos. yearly, 3 vols. [4] **46.** M54*d*. *J. A. Barth, Dörrienstrasse 16, Leipzig.*

Annals of Tropical Medicine and Parasitology. *Irr.* **8.** 1£2s6d *d*. *University Press of Liverpool, 57 Ashton St., Liverpool.*

Anzeiger der kaiserlichen Akademie der Wissenschaften. Year book containing

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the *Sits. Akad. Wiss., Math.-nat. Klasse*, which see.

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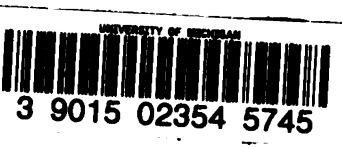

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